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Math 6 Unit 2

LearnEveryWare

Student Learning Guide

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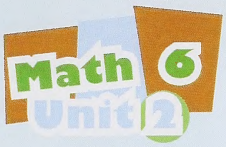

Math 6 Learn EveryWare – Unit 2 Student Learning Guide
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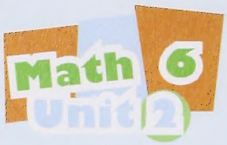

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Math 6 Unit 2

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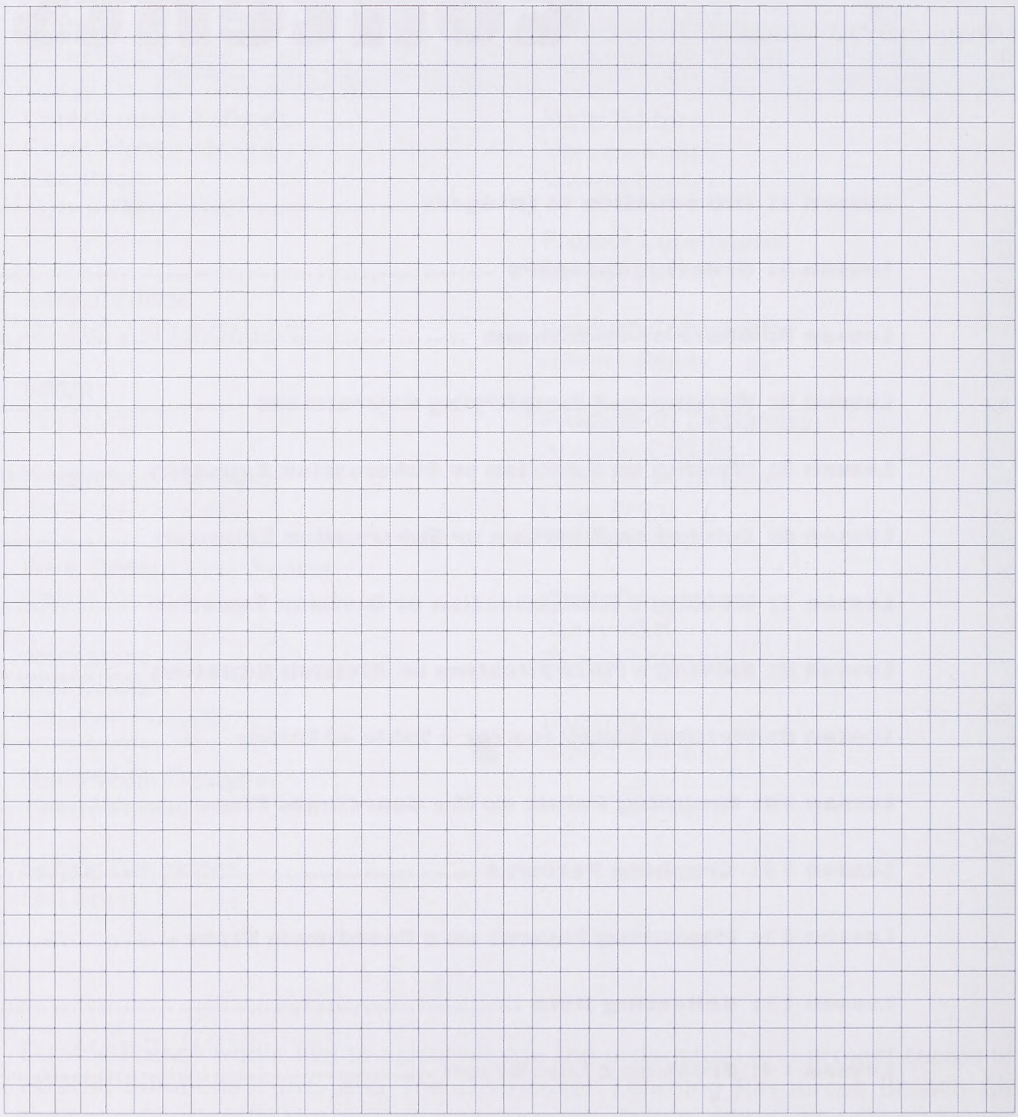


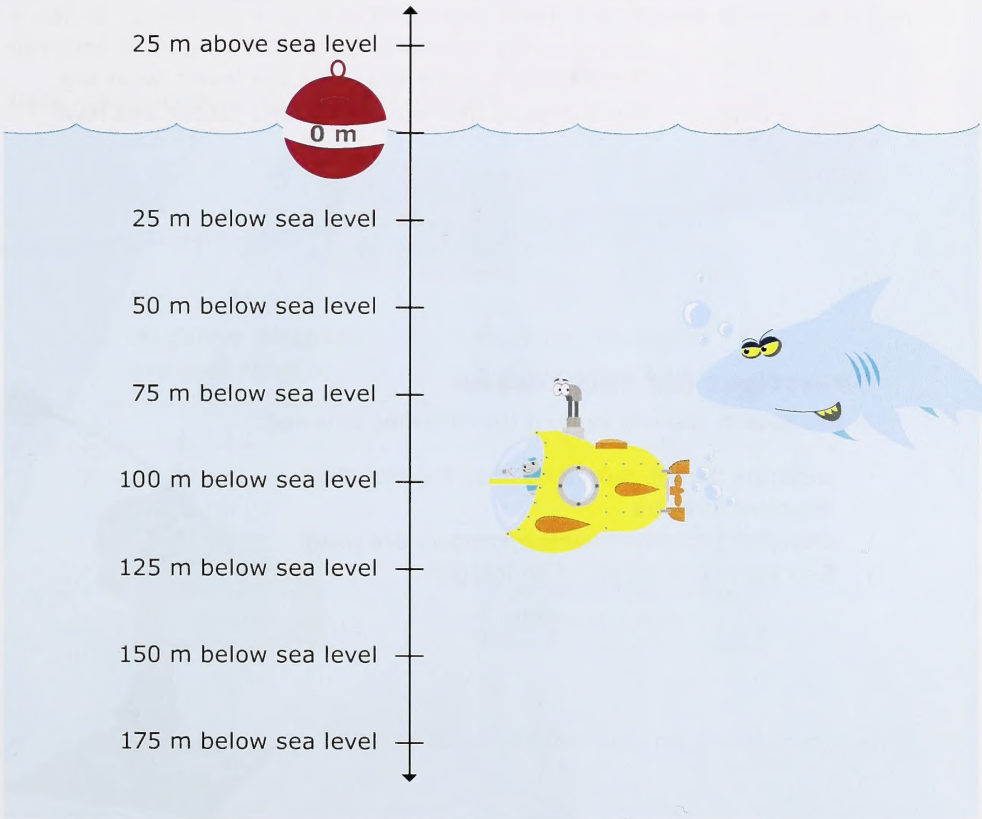
Math 6 Unit 2

Lesson 1

Introduction to Integers

Submarines

A submarine can move around in the water at various depths. If the submarine is below the surface of the sea it is said to be a number of metres below sea level. If a submarine is on the surface it is at sea level.


25 m above sea level
0 m
25 m below sea level
50 m below sea level
75 m below sea level
100 m below sea level
125 m below sea level
150 m below sea level
175 m below sea level

This submarine is 100 metres below sea level.

In mathematics you can express the measures below sea level with a number called an **integer**. You will learn how to express numbers that are greater than and less than 0 using integers.

An integer for the depth of this submarine is: -100 metres.

This is "negative 100 metres" when you read it out loud.

Reflection

If the surface of the sea is "at sea level", what are some objects that would be found "above sea level"?

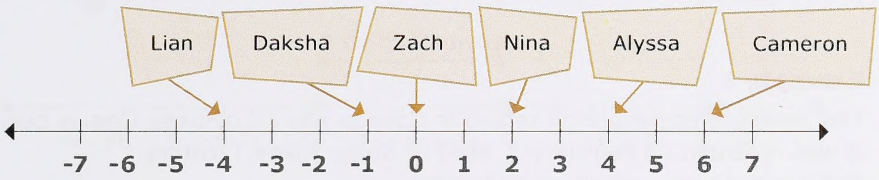
Objectives for this Lesson

In this lesson you will explore the following concepts:

- Describe numbers on a number line including negative integers
- Describe contexts in which integers are used
- Express the opposite of an integer

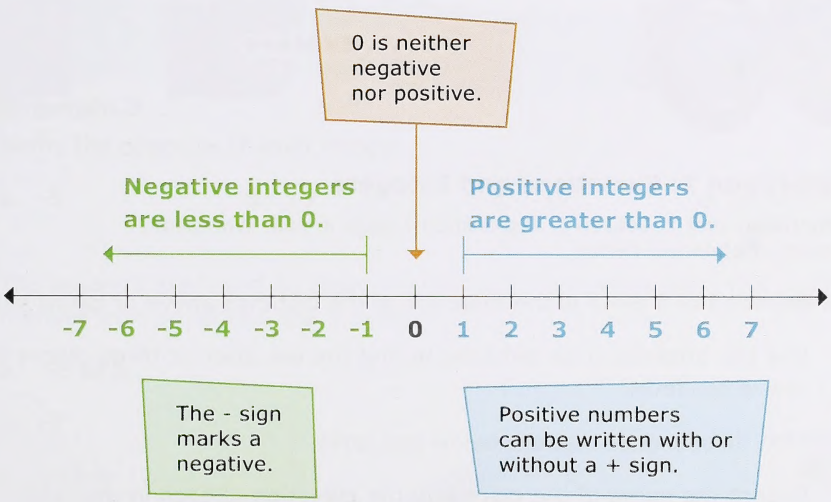
Integers

The number line shows the amount of money that each student has in their pocket or owes their parent. A value of -4 represents a debt of $4.



The numbers -4 and 6 are integers. The set of integers is expressed as {...-3, -2, -1, 0, 1, 2, 3 ...}. The three dots mean that the set continues in that direction without end. This set of numbers has no end.

Here is a description of the set of integers.


0 is neither negative nor positive.
Negative integers are less than 0.
Positive integers are greater than 0.
-7 -6 -5 -4 -3 -2 -1 0 1 2 3 4 5 6 7
The - sign marks a negative.
Positive numbers can be written with or without a + sign.

- Go online to watch the Notepad Tutor Lesson: Understanding Integers.

Real World Integers

There are real life values that may be expressed as positive and negative integers. You need to be able to decide if a value is positive or negative for different contexts.

Example 1

The lowest temperature on record in Canada was 63 degrees Celsius below 0. It was recorded on February 3, 1947 in Snag, Yukon Territory.
Express the temperature as an integer.

The temperature "63 degrees Celsius below 0" is a value less than 0.
This is a negative integer: -63° C

Exploration 1: Elevations and Integers

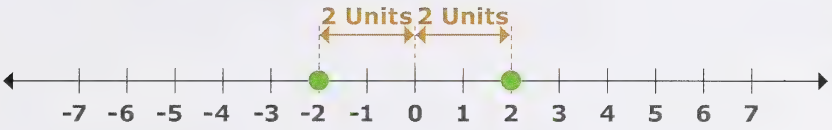
Materials: Unit 2, Lesson 1, Exploration 1 page in your Workbook, Internet or almanac, Pencil

The elevation of a place is the measure of the distance above or below sea level.

1. Use the Internet or an almanac to find the elevation of three places that are above sea level.
2. Find three places that are below sea level.
3. Record the name of the place and the elevation of each in the table, using an integer.

Opposites of Integers

Every positive and negative integer has an **opposite**. The opposite of an integer is found the same distance from 0 on the number line, but on the opposite side of 0. The opposite of +2 is -2.



Example 2

A quarterback is sacked for a loss of 15 yards. Write that distance as an integer. What is its opposite?

A loss of 15 yards is less than 0: -15 yards

The opposite of -15 yards: +15 yards

Example 3

Name the opposite of each integer.

a. -5 b. +7 c. -12 d. 4

The answers are found by changing the sign. You can express the positive number with or without the + symbol.

a. +5 or 5

b. -7

c. +12 or 12

d. -4

Let's Explore

Exploration 2: Exploring Opposites

Materials: Unit 2, Lesson 1, Exploration 2 page in your Workbook, Integer Counters from the back of this unit in your Workbook, Pencil, Scissors

You can use integer counters to help you understand the relationship between positive and negative integers. An integer counter with a + represents the integer +1. An integer counter with a – represents the integer -1.

Cut out and use integer counters to complete the following.

1. Model -10.
2. Model +10.
3. What is the same about the two models?
4. What is different about the two models?

A zero pair is found by putting a + integer counter together with a – integer counter. This is called a zero pair because the result of pairing the two is zero.

Zero Pair

5. How many zero pairs can you make with your models of -10 and +10 together?
6. Create a model of a pair of opposites.
7. Write the values of your opposites.
8. How many zero pairs can you create from your models?
9. What is the value of a zero pair? Explain.
10. Make a model of +5 and -3. How many zero pairs can you make?

For 11-14: Either record an oral answer or write one in your Workbook. If recording, follow the recording instructions in your Workbook.

11. Describe the integer counters that are not part of the zero pairs.
12. Choose the word that best completes this statement: A pair of opposites (always, sometimes, or never) creates the same number of zero pairs.
13. Reflect: What is the sum of a pair of opposites? Explain.
14. Reflect: Which integer does not have an opposite? Explain.

Number Lines

You can use number lines to show the value of integers. Create number lines so that they will contain all of the values you want to graph. Place a point on the value that you want to represent.

Example 4

Golfers try to score under par. Draw a number line to show a golfer with a score of -4 and another with a score of +2.

Draw a number line with at least four marks to the left and right of 0. Label all values on the number line:

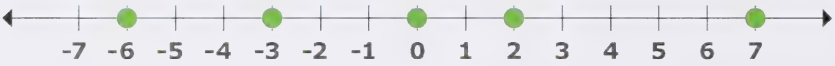
Place points at -4 and +2:

Example 5

Place the following set of integers on a number line: {-3, 0, -6, 2, 7}

Draw your number line and make sure that it ranges from -7 to 7:

Place points at each value: {-3, 0, -6, 2, 7}



Let's Practice

- Turn in your Workbook to Unit 2, Lesson 1 and complete 1 to 22.

Lesson 2

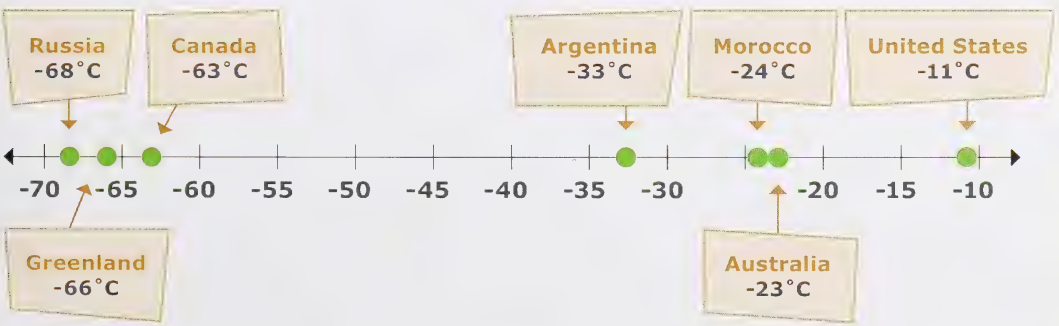
Ordering Integers

Comparing Temperatures

The lowest temperatures ever recorded for several cities in the World are shown in the chart.

Country	City	Record Low	Date
Australia	Charlotte Pass	-23°C	Jun. 29, 1994
Greenland	Northice	-66°C	Jan. 9, 1954
Canada	Snag, Yukon Territory	-63°C	Feb. 3, 1947
United States	Mauna Kea Observatory, Hawaii	-11°C	May 17, 1979
Morocco	Ifrane	-24°C	Feb. 11, 1935
Russia	Oimekon	-68°C	Feb. 6, 1933
Argentina	Sarmiento	-33°C	Jun. 1, 1907

Put the temperatures on a number line to easily see their order from least to greatest:



The lowest temperature in this group is -68° Celsius or 68° Celsius below zero. This temperature was recorded in Russia. The highest of these temperatures is -11° C and was recorded in the United States. Here is a list of the temperatures in order from least to greatest:

-68°C, -66°C, -63°C, -33°C, -24°C, -23°C, -11°C

Reflection

What are some other values that you could compare using a number line?

Objectives for this Lesson

In this lesson you will explore the following concepts:

- Use a number line to explain how integers are ordered
- Compare two integers
- Order given integers in ascending or descending order

- Go online to complete the Concept Capsule: Ordering Decimals (to thousandths).

Ordering Integers

Using a number line can help you understand how numbers compare to one another in terms of their size.

Notice that as you move from left to right on the number line the numbers increase in size. This means that if a number is to the left of another it is smaller.

Example 1

Order the numbers in the given set from least to greatest: {4, 0, -3, -5, 2}

Use a number line to plot the points:

Now your values are in order from least to greatest, so just list them:

-5, -3, 0, 2, 4

Example 2

Order the numbers in the given set from greatest to least: {2, -6, 6, 1, -3}

Use a number line to plot the points:

Now your values are in order from least to greatest, so just list them from right to left:

6, 2, 1, -3, -6

Comparing Integers

You can use the number line to compare numbers using **inequalities**. An inequality compares the value of two numbers using a symbol:

Inequality Symbols	
less than	greater than
<	>

An inequality sentence has two sides and a symbol that compares the sides:

3 < 8 is read as "3 is less than 8"

-2 < 2 is read as "negative 2 is less than positive 2"

An equation has two sides and an = symbol that says the two sides are the same:

-5 = -5 is read as "negative 5 is equal to negative 5"

If two numbers are on the number line you know that the smallest number comes first from left to right:

-3 is to the left of +1 on the number line. You can write the comparison of these numbers in two forms and in various ways:

Words:	-3 is less than +1	**OR**	+1 is greater than -3
Symbols:	-3 < +1	**OR**	+1 > -3

The symbol points to the smaller number.

Example 3

Write <, >, or = to make each sentence true.

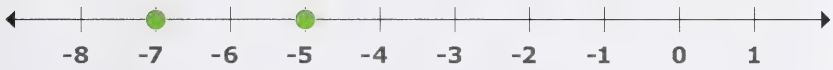
a. -4 ___ 3 b. -5 ___ -7 c. 3 ___ 3

Compare using a number line if you need to:

a.

The number line shows that -4 is less than 3: -4 < 3

b.



The number line shows that -5 is greater than -7: -5 > -7

c.

The number line shows that 3 is equal to 3: 3 = 3

- Go online to watch the Notepad Tutor Lesson: Comparing Integers.

Let's Explore

Exploration 1: Ordering Temperatures

Materials: Unit 2, Lesson 2, Exploration 1 page in your Workbook, Internet or almanac, Pencil

1. Use an almanac or the Internet to research the average low temperatures in your province over the last twelve months.
   Record the temperatures in the table in your Workbook.
2. Order the temperatures you have found from least to greatest.
3. Describe some other values that you could find in an almanac that are integers.
4. Write two inequalities using your list of integers.

Let's Practice

- Turn in your Workbook to Unit 2, Lesson 2 and complete 1 to 25.

Lesson 3

Order of Operations

Ice Hockey

Hockey is one of the most popular international sports. It began in Canada as a combination of games from Europe. A form of hockey was first played in Nova Scotia in the early 1800s. In the 1900s, players started wearing protective gear like shin pads. Goalies wore chest protectors to protect themselves against flying pucks.

Zach and Lian are joining an amateur hockey league. The coach has to buy uniforms and equipment for the team to replace what is missing. The list of prices and what they need are in this chart:

Hockey Equipment		
Equipment	**Number**	**Cost per Item**
Uniforms	12	$95
Helmets	8	$48
Protective equipment combo	20	$102

To find the total cost, the coach uses the following expression:

$$12 \times 95 + 8 \times 48 + 20 \times 102$$

To simplify this expression the coach uses the order of operations by multiplying first and then adding the products:

$$12 \times 95 + 8 \times 48 + 20 \times 102 = \square$$
$$1\,140 + 384 + 2\,040 = \square$$
$$1\,524 + 2\,040 = 3\,564$$

The coach needs $3 564 to purchase equipment for the team.

Reflection

Would the coach get the same result by adding first?

Objectives for this Lesson

In this lesson you will explore the following concepts:

- Explain the need to have a standardized order of operations
- Apply the order of operations to solve multi-step problems
- Use technology to solve multi-step problems

Order of Operations

An **expression** is a mathematical phrase that combines numbers, operations, and sometimes **variables**.

Sample expressions:

$4.03 - 2$ $18 \div 3$ $2(3 + 4) - 7$

A parenthesis in an expression is another way to express the operation of multiplication.

$5(10) = 50$

The **order of operations** is a set of rules that tells us the order in which we solve an expression. This is used for expressions that have more than one operation. The order of operations is:

1. Parentheses: perform any operation inside a pair of parentheses
2. Multiply and Divide: do these in order from left to right
3. Add and Subtract: do these in order from left to right

Later, the order of operations will be expanded when you learn other operations.

Example 1

Simplify the expression:

$2 \times 5 + 3 \times 6 - 2 \times 3$

Use the order of operations:

1. Parentheses: there are no parentheses so move to the next step.

$2 \times 5 + 3 \times 6 - 2 \times 3 = \square$

2. Multiply and Divide: this is done in order from left to right.

$2 \times 5 + 3 \times 6 - 2 \times 3 = \square$

$10 + 18 - 6 = \square$

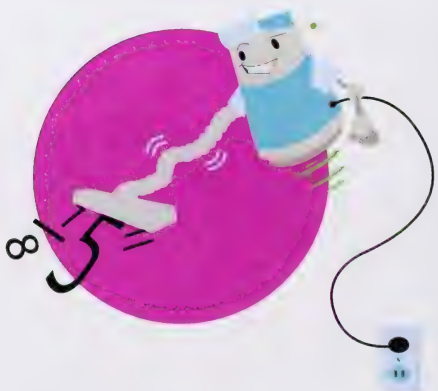
3. Add and Subtract in order from left to right.

$2 \times 5 + 3 \times 6 - 2 \times 3 = \square$

$10 + 18 - 6 = \square$

$28 - 6 = 22$

} Addition is first. Subtraction is last.



Example 2

Simplify the expression:

$3(28 \div 4) - 4 \times 2 + 5(3)$

1. Parentheses: perform the operation inside of the parentheses.

$3(28 \div 4) - 4 \times 2 + 5(3) = \square$

$3(7) - 4 \times 2 + 5(3) = \square$

2. Multiply and Divide: do these in order from left to right.

$3(28 \div 4) - 4 \times 2 + 5(3) = \square$

$3(7) - 4 \times 2 + 5(3) = \square$

$21 - 8 + 15 = \square$

} The parentheses now tell you to multiply.

3. Add and Subtract: do these in order from left to right.

$3(28 \div 4) - 4 \times 2 + 5(3) = \square$

$3(7) - 4 \times 2 + 5(3) = \square$

$21 - 8 + 15 = \square$

$13 + 15 = \mathbf{28}$

} Subtraction is first. Addition is last.

Let's Practice

- Go online to watch the Notepad Tutor Lesson: Order of Operations (Excluding Exponents).

- Turn in your Workbook to Unit 2, Lesson 3 and complete 1 to 16.

Using Technology

You are expected to be able to simplify expressions using order of operations. Your calculator will perform the order of operations for you so that you do not have to work it out. Sometimes you will need to use technology to solve harder problems. Other times you will use your calculator to understand concepts.

Use a calculator to explore the concept of order of operations.

Let's Explore

Exploration 1: Does Order Make a Difference?

Materials: Unit 2, Lesson 3, Exploration 1 page in your Workbook, Calculator (must have parentheses), Pencil

1. Observe the following expressions:

   $80 \div 2 \times 8 + 9$

   $80 \div (2 \times 8) + 9$

   $80 \div 2 \times (8 + 9)$

2. Do you think each expression will have the same answer? Explain your answer.

3. Use your calculator to find each answer:

   $80 \div 2 \times 8 + 9 =$ _____

   $80 \div (2 \times 8) + 9 =$ _____

   $80 \div 2 \times (8 + 9) =$ _____

4. Place parentheses in the problem to create a sentence equivalent to 30.

   $38 + 4 \div 7 \times 3 + 2$

For 5 - 6: Either record an oral explanation or write one in your Workbook. If recording, follow the recording instructions in your Workbook.

5. Explain how you found your answer to number 4.

6. Explain how the order of operations is used to solve this problem:

   $6(13 + 7) - 4(8) \times 9 \times 2$

You may also use the order of operations to solve problems when the numbers include decimals, fractions, or are very large.

Example 3

Simplify the expression: 4.18 ÷ (2.4 – 1.3) + 3.8 x 1.2

On your calculator, use the following keystrokes:

4 . 18 ÷ (2 . 4 – 1 . 3) + 3 . 8 X 1 . 2 =

The calculator should display the answer: **8.36**

Reflection

What operation did the calculator perform first? Second?

Example 4

Simplify the expression: 4 786 x 24 – 12 x 88 + 1 290 ÷ 215

4786 X 24 – 12 X 88 + 1290 ÷ 215 =

On your calculator, use the following keystrokes:

The calculator should display the answer: **113 814**

Reflection

What operation did the calculator perform first? Second?

When solving problems, it is important that you set up the correct expression before using the order of operations. You need to be able to write one expression that you would use to solve a word problem.

Example 5

Write an expression for the problem. Simplify the expression using a calculator. Lian and Cameron are planting flowers in a garden. Find the total cost of the items used to plant their garden.

Item	Number of Items	Cost per Item
Tray of Flowers	8	$8.75
Bag of Soil	2	$4.50
Bag of Fertilizer	1	$6.95

The total cost is found using this sentence:

number of flower trays x cost + number of bags of soil x cost + number of fertilizer x cost

Now use the numbers found in the table:

8 x 8.75 + 2 x 4.50 + 1 x 6.95

Use your calculator to find the total cost:

$85.95

Let's Practice

- Turn in your Workbook to Unit 2, Lesson 3 and complete 17 to 25.

Lesson 4

Writing and Simplifying Expressions

Snowboarding

Snowboarding is increasing in popularity. Snowboarders can go fast, perform tricks in the air, and land jumps. To avoid injury, snowboarders need to wear proper gear. They need helmets, boots, bindings and boards. Each item needs to fit properly.

The length of a snowboard depends on the height of the snowboarder. The ideal length of a snowboard is found by standing it on the ground. The tip of the board should fall between the person's chin and nose. Snowboards are measured in centimetres.

Daksha's snowboard is 2 cm longer than Alyssa's snowboard.

You do not know the length of either snowboard. You can use a variable to represent the length of Alyssa's board. You can write a variable expression for the length of Daksha's snowboard.

Length of Alyssa's snowboard: **a**

Length of Daksha's snowboard: length of Alyssa's board + 2 cm

a + 2

Reflection

If you let the variable **d** equal the length of Daksha's board, how would the expression for Alyssa's board be written?

Objectives for this Lesson

In this lesson you will explore the following concepts:

- Write a variable expression for a situation
- Evaluate a variable expression
- Write a variable expression for the relationship in a given table
- Write a variable expression to represent a pattern rule

Variable Expressions

In Algebra, you use a language that includes numbers and symbols. Some very common symbols are **variables**. A variable is usually a letter that is used to represent an unknown value.

Variable Expressions	Meaning
2 + a	the sum of 2 and some number
m – 7	7 less than some number
8x	8 times some number
$\frac{10}{k}$	10 divided by some number

Notice that the multiplication operation is represented by a number and a variable written side by side.

8x means 8 times **x**

The variable **x** is often used in Algebra.

2 + x means the sum of 2 and x.

This means that in Algebra, you no longer use **x** to represent multiplication. If you did, it would be difficult to tell which **x** represents multiplication and which represents the variable.

8 x x

For this reason, multiplication can also be written in the following ways. Each means 8 times a number:

$8x$ $8(x)$ $8 \cdot x$

Division is also written differently: $\frac{10}{k}$

This means ten divided by k or $10 \div k$.

You can use variables to describe situations that have unknown values.

Example 1

Write a variable expression for the situation:

four more than Alyssa's flowers

Variable: Let **a** be the number of flowers Alyssa has.

Expression: **four** **more than** **Alyssa's Flowers**
4 **+** **a**

The expression is: **4 + a**

Example 2

Write a variable expression for the phrase:

three times a number decreased by five

Variable: Let **n** be the number.

Expression: **three** **times** **a number** **decreased by** **five**
3 **•** **n** **–** **5**

Decreased by means subtract.

The expression is: **3n – 5**

Evaluating Expressions

To evaluate an expression you replace the variables with a given value and then use order of operations to simplify the expression.

Example 3

Evaluate **3x + 6** if **x = 4**.

The sentence x = 4 gives you a value for the variable. The 3 and the **x** are written side by side indicating multiplication.

Write the expression:	3x + 6
Replace the **x** with 4:	= 3(4) + 6
Simplify using order of operations:	= 12 + 6
	= **18**

Example 4

Evaluate **7(m – n) + 3m** if **m = 12** and **n = 4**.

Write the expression:	7(m – n) + 3m
Replace **m** with 12 and **n** with 4:	= 7((12) – (4)) + 3(12)
Simplify using order of operations:	= 7(8) + 3(12)
	= 56 + 36
	= **92**

Let's Practice

- Turn in your Workbook to Unit 2, Lesson 4 and complete 1 to 23.
- Go online to watch the Notepad Tutor Lesson: Expressions vs. Equations.

Pattern and Function Rules

You can use a variable expression to represent a rule. In the table shown there is a rule for the second column that uses the value in the first column.

Input	Output
n	n + 3
1	4
2	5
3	6
4	7
5	8

The first column is called the input. The last column is called the output. The output is based on the input and the rule. To get the values in the last column, the variable **n** was replaced by the value in the first column:

Input	Work	Output
n	(n) + 3	n + 3
1	(1) + 3	4
2	(2) + 3	5
3	(3) + 3	6
4	(4) + 3	7
5	(5) + 3	8

Function Rule
n + 3

The last column is found using a **function rule**. This rule is a variable expression. It describes the relationship between the input and the output. As you can see, the variable changes for each value in the first column. The entire table is called a function table.

Example 5

Complete the function table.

k	k – 6
15	
12	
8	

The function rule is **k – 6**. Subtract 6 from each input.

Input	Output
k	k – 6
15	
12	
8	

→

Work
(k) – 6
(15) – 6 = 9
(12) – 6 = 6
(8) – 6 = 2

→

Input	Output
k	k – 6
15	9
12	6
8	2

Write the output values in the table.

You can also find the function rule for a function table by observing the relationship between the input and the output.

Example 6

Find the function rule for the given table.

x	☐
0	0
1	5
2	10
3	15

Can you add the same number to each **x** to get the second value?

$0 + 0 = 0$

$1 + 4 = 5$

$2 + 8 = 10$

No, each number added is different.

Can you multiply the same number by each **x** to get the second value?

$0 \cdot ? = 0$

$1 \cdot 5 = 5$

$2 \cdot 5 = 10$

$3 \cdot 5 = 15$

Yes!

When you start with 0 it is harder to see the pattern.
By starting with 1 you can see that the rule "multiply by 5" works for all values.

The function rule is **5x**.

Let's Explore

Exploration 1: What's My Rule?

Materials: Unit 2, Lesson 4, Exploration 1 page in your Workbook, Function rule cards and page of function tables from the back of this Unit in your Workbook, Scissors, Pencil

This is a game that should be played with two players.
Find a partner to play it with you. Cut out the function rule cards and place them face down in a stack on the table. Each player gets a sheet of function tables.

Player A:

1. Draw a card from the deck.
2. Fill in a function table using this function rule.
3. Show the table to Player B.

Player B:

1. Guess the rule for Player A's table.
2. If you get the rule correct, you get one point.
3. Draw a card and repeat the process.

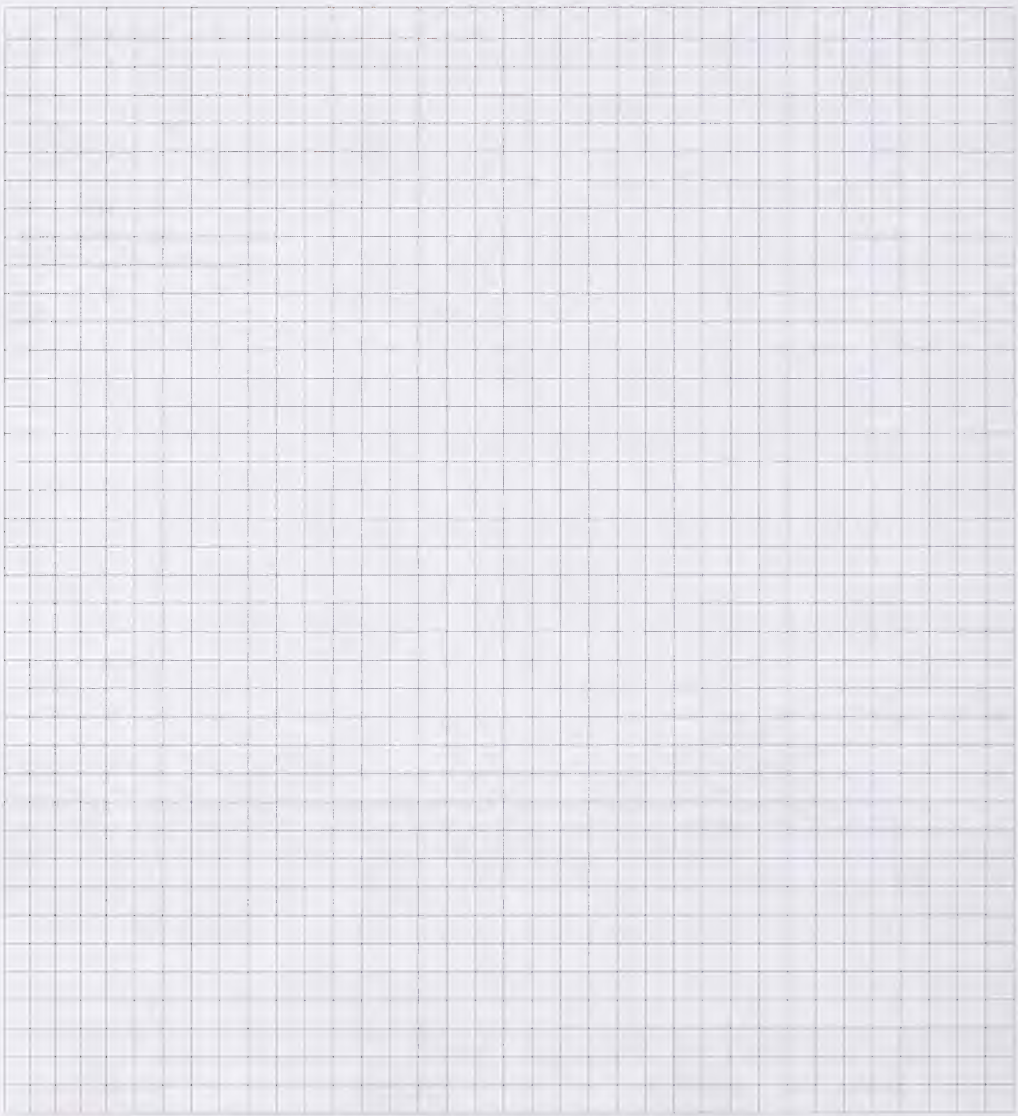
Players take turns until each player has had 5 chances to guess the rule. The player with the most points wins.

For the Reflect: Either record an oral description or write one in your Workbook. If recording, follow the recording instructions in your Workbook.

Reflect: Describe the strategies you used to find the function rules.

Let's Practice

- Turn in your Workbook to Unit 2, Lesson 4 and complete 24 to 33.



Lesson 5

Writing an Addition or Subtraction Equation

Baseball Stadiums

Baseball is a very popular sport. There are some major league baseball stadiums that can hold more than forty thousand people. The SkyDome Stadium was built in 1989 in Toronto. The SkyDome Stadium is now called the Rogers Centre. During a baseball game, the Rogers Centre seats 46 105 people. The Olympic Stadium in Montreal opened as a major league baseball stadium in 1976.

The Olympic Stadium holds 8 895 more people than the Rogers Centre. How many people does the Olympic Stadium hold?

Here are two equation models that work for this situation:

OR

The variable is found in the question: How many people does the Olympic Stadium hold?

Variable: x = Olympic Stadium capacity

Equations: $x - 46\,105 = 8\,895$ OR $x - 8\,895 = 46\,105$

Lesson 5: Writing an Addition or Subtraction Equation

Reflection

Do you remember how to solve equations so you can find the capacity of the Olympic stadium?

Objectives for this Lesson

In this lesson you will explore the following concepts:

- Develop and justify equations that illustrate the commutative property of addition
- Identify the unknown in a problem
- Represent a problem with an equation
- Create a problem for a given equation

Equations

An **equation** is a mathematical sentence that shows that two mathematical expressions are equal.

Equation: $x + 7 = 15$

In words: Seven more than some number is equal to fifteen.

The **commutative property of addition** says that you can add two quantities in any order and you will get the same result.

$5 + a = a + 5$

The commutative property of addition allows you to write the same equation in these ways:

$\underbrace{5 + a}_{} = 12$ $\qquad$ $\underbrace{a + 5}_{} = 12$

These equations have the same meaning: Five more than some number is equal to 12.

Example 1

Write an equation for the sentence: Twelve more than a number equals twenty.

Identify the numbers:

Twelve more than a number equals twenty.
12 20

Identify the variable:

Twelve more than a number equals twenty.
12 n 20

Use any letter.

Identify the operation and equal symbols:

Twelve more than a number equals twenty.
12 + n = 20

The left side of the equation can be written as $12 + n$ OR $n + 12$ due to the commutative property of addition.

The equation is: $n + 12 = 20$

The phrase "more than" is special when writing equations or expressions. You can use "more than" to write an equation in two ways:

Seven more than a number is ten.	
$7 + n = 10$	$n + 7 = 10$

This is allowed because of the commutative property of addition.

Reflection

Does the commutative property apply to subtraction?

You can also rewrite an addition equation as a subtraction equation. The following equations will result in the same answer for **n**:

$n + 8 = 12$ **OR** $12 - n = 8$

Here is an exploration that will help you understand how this works.

Lesson 5: Writing an Addition or Subtraction Equation

Let's Explore

Exploration 1: Many Ways to Write Equations

Materials: Unit 2, Lesson 5, Exploration 1 page in your Workbook, Counters, 2 Small Cups, Pencil

Work with a partner. You will take turns hiding counters under your cup. The cup represents the variable.

1. Put 15 counters in the middle of your work space.
2. Partner 1 takes some counters and hides them under a cup.
3. Write a subtraction equation to describe the action.
4. Write an addition equation to describe the action.
5. Put all the counters back together.
6. Partner 2 takes some counters and hides them under a cup.
7. Write a subtraction equation to describe the action.
8. Write an addition equation to describe the action.

For 9: Either record an oral description or write one in your Workbook. If recording, follow the recording instructions in your Workbook.

9. Describe how addition and subtraction equations describe the same action.
10. Write an equation and model it using your cup and counters. Sketch your model.

Lesson 5: Writing an Addition or Subtraction Equation

Example 2

Write an equation for the sentence: Eight equals six less than some number.

Identify the numbers:

Eight equals six less than some number.
8 6

Identify the variable:

Eight equals six less than some number.
8 6 x

Identify the symbols:

Eight equals six less than some number.
8 = 6 − x

Less than tells you to change the order.

The expression on the right side must read x − 6.
You cannot write 6 − x, as it does not have the same meaning.

The equation is: $8 = x - 6$

Reflection

Why do x − 6 and 6 − x have different meanings?

Lesson 5: Writing an Addition or Subtraction Equation

Equations can also be written with the left side and the right side reversed. They will still have the same meaning.

Fifteen is five more than a number.	
15 = 5 + n	5 + n = 15
15 = n + 5	n + 5 = 15

This addition sentence has four possible ways of being written as an equation.

Reflection

How many ways can you write a subtraction equation?

Let's Practice

- Turn in your Workbook to Unit 2, Lesson 5 and complete 1 to 17.
- Go online to complete the Concept Capsule: Writing Addition and Subtraction Equations for Word Problems.

Word Problems and Equations

There are many ways to solve problems using equations. You may be able to solve a problem without an equation, but writing an equation is important. You will use equations to describe situations that have many solutions that you will find in the future.

Example 3

Write an equation for the following word problem.

The weight of an empty lumber truck is 13 000 kg. The weight limit of a certain bridge is 37 000 kg. What is the maximum weight of lumber that the truck could carry without exceeding the weight limit of the bridge?

Plan:

You can write a statement that summarizes the problem:

The weight of the empty truck plus some weight is the weight limit of the bridge.

Write an equation:

1. Identify the parts you know and the variable:

   The weight of the empty truck plus some weight is the weight limit of the bridge.
   13 000 x 37 000

2. Identify the symbols for operation and equals:

   The weight of the empty truck plus some weight is the weight limit of the bridge.
   13 000 + x = 37 000

An equation is: **13 000 + x = 37 000**

Lesson 5: Writing an Addition or Subtraction Equation

Let's Practice

- Turn in your Workbook to Unit 2, Lesson 5 and complete 18 to 25.

Lesson 6

Solving an Addition or Subtraction Equation

Whales

The blue whale is a baleen whale. That means that it eats mainly small crustaceans known as krill. Blue whales are an endangered species due to being hunted for their meat and blubber. There are now laws to protect them from commercial whaling. The blue whale is believed to be the largest mammal ever to have existed.

Whale	Average Length
Blue	29 metres
Humpback	17 metres
Sperm	16 metres
Orca	8 metres

Alyssa spotted a sperm whale on a whale watching trip. Her uncle said that its length was about 5 metres shorter than the average length of a sperm whale.

Variable: w = length of the sperm whale Alyssa saw

Equation: w + 5 = 16

Solution: w = 11

The whale Alyssa saw was 11 metres long.

You will learn how to solve an equation using the subtraction property of equality in this lesson.

Objectives for this Lesson

In this lesson you will explore the following concepts:

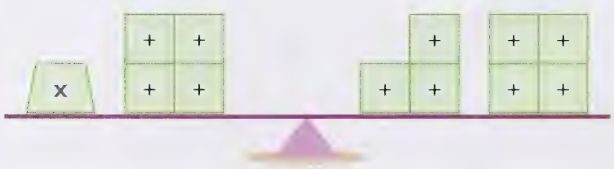
- Model the preservation of equality for addition and subtraction equations
- Model addition and subtraction equations
- Solve addition and subtraction equations

Balancing Equations

A mathematical sentence that says two expressions are equal is an equation. This means that both sides of the equation have the same value.

You can imagine it like a balance beam:

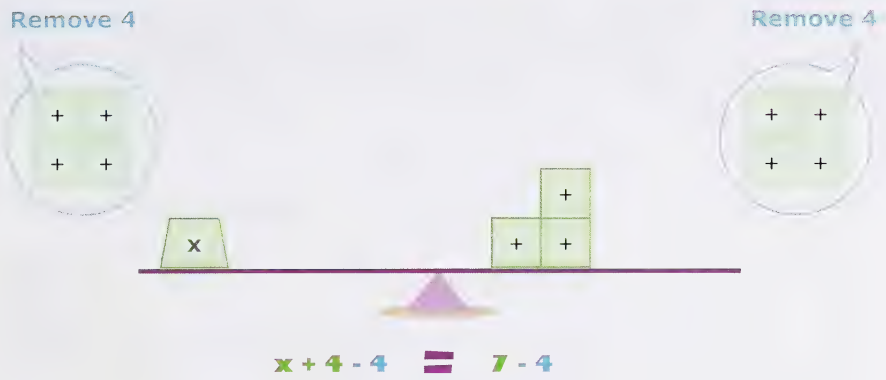
The left side: x + 4 **The right side: 7**



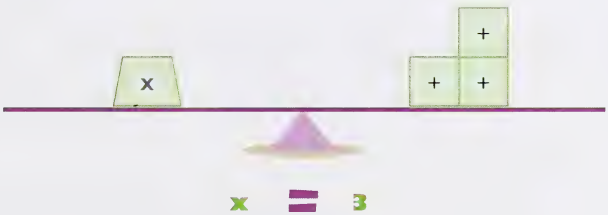
$x + 4 = 7$

These two sides have the same value.

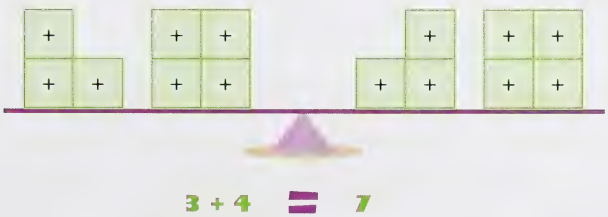
With a balance beam, you can take away or add the same value without changing the balance.



By removing 4 ones from both sides you are left with the variable on the left and 3 ones on the right. That means that x = 3.



In this equation, **x** represents a value of 3. When you took 4 away from both sides of the equation, you did not change that value. You can see this by replacing the **x** with 3 on the original balance beam:



The value of **x** does not change when you add or subtract the same value on both sides of the equation.

Let's Explore

Exploration 1: Balancing Equations

Materials: Unit 2, Lesson 6, Exploration 1 page in your Workbook, Balance Beam Mat, Balance Beam Models, Scissors, Pencil

1. Cut out the balance beam models.
2. a. Model $x + 3 = 10$ on your Balance Beam Mat.
   b. In $x + 3 = 10$, what value does **x** represent?
   c. Add 2 to both sides of the equation.
   d. What value does **x** represent?
3. a. Model $x + 4 = 9$ on your Balance Beam Mat.
   b. In $x + 4 = 9$, what value does **x** represent?
   c. Add 2 to both sides of the equation.
   d. What value does **x** represent?
   e. Reflect: Why doesn't the value of **x** change when you add the same amount to both sides of the equation?
4. a. Model $x + 8 = 12$ on your Balance Beam Mat.
   b. In $x + 8 = 12$, what value does **x** represent?
   c. Subtract 5 from both sides of the equation.
   d. What value does **x** represent?
5. a. Model $x + 9 = 16$ on your Balance Beam Mat.
   b. In $x + 9 = 16$, what value does **x** represent?
   c. Subtract 5 from both sides of the equation.
   d. What value does **x** represent?

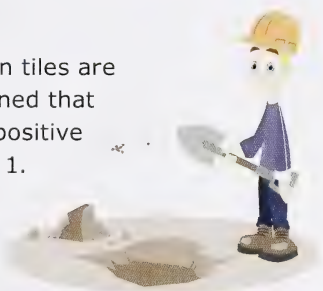
e. Reflect: Why doesn't the value of **x** change when you subtract the same amount from both sides of the equation?

Modelling Equations

You can model equations and expressions using Algebra Tiles. Here are the tiles that you can use to represent addition expressions:

Expression	Algebra Tile Model
x + 3	x + + +
x − 3	x − − −

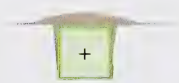
The blue tiles are used to show subtraction. The green tiles are used to show addition. In modelling integers you learned that a zero pair is formed using a negative one tile and a positive one tile. It is like digging a hole of 1 and filling it with 1.



Dig the hole:

Negative one is the depth of the hole.

Fill the hole:



Positive one fills the hole again.

Now you are back to zero.

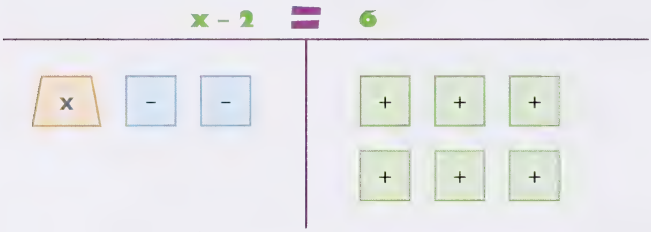
The pair below is called a zero pair because when you put them together you get zero.

You can use this concept to model solving equations.

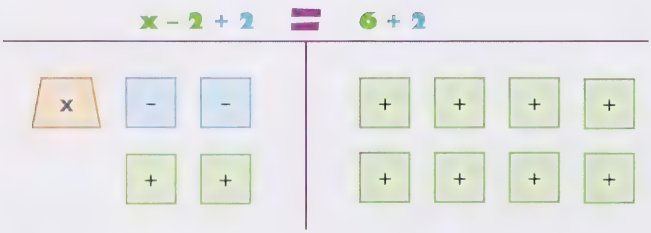
Example 1

Solve the equation $x - 2 = 6$ using Algebra Tiles.

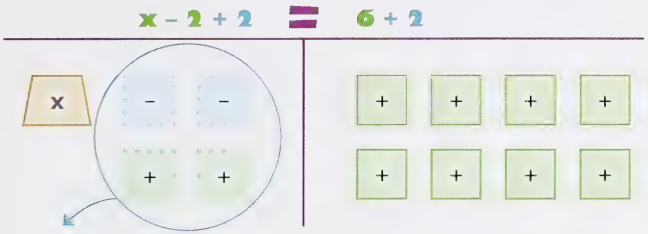
Model the equation:



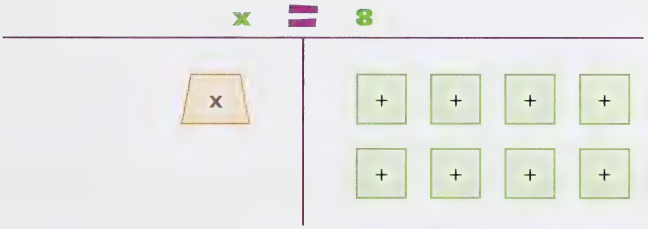
Add 2 to each side:



Remove zero pairs:



Solution:



The solution is x = 8. You can check the solution by replacing the **x** with 8:

$x - 2 = 6$

$(8) - 2 = 6$

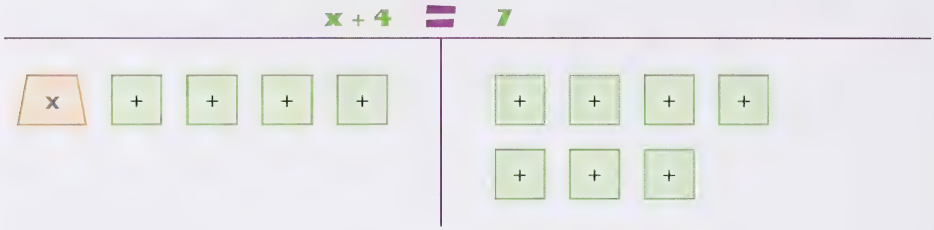
$6 = 6$

The answer is x = **8**.

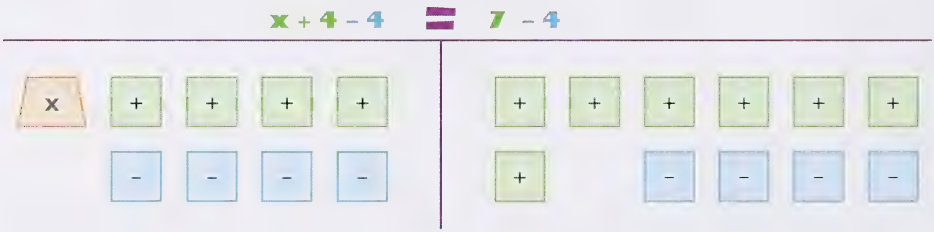
Example 2

Solve $x + 4 = 7$ using Algebra Tiles.

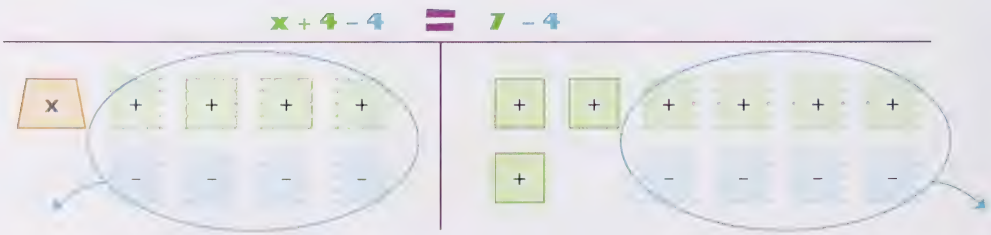
Model the equation:



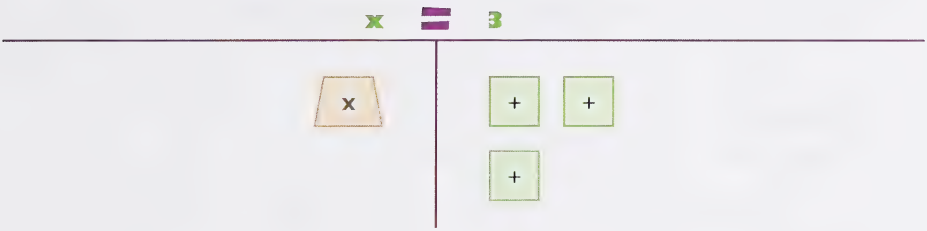
Subtract 4 from both sides:



Remove zero pairs:



Solution:



Check:

(3) + 4 = 7

7 = 7

The answer is: x = 3.

You can also solve equations without models. Use the properties of equality to solve equations.

Subtraction Property of Equality	
You can subtract the same number from both sides of an equation without changing the value of the variable.	$n + 5 = 12$ $n + 5 - 5 = 12 - 5$ $n = 7$

Addition Property of Equality	
You can add the same number to both sides of an equation without changing the value of the variable.	$n - 5 = 12$ $n - 5 + 5 = 12 + 5$ $n = 17$

When the numbers in an equation are decimals, fractions, or have large values, then you can use the properties of equality to solve.

The following example uses the **subtraction property of equality**.

Example 3

Solve $x + 16 = 31$. Check your answer.

$\mathbf{x + 16 = 31}$	Write the equation.
$x + \underbrace{16 - 16}_{0} = \underbrace{31 - 16}_{15}$	Subtract 16 from both sides.
	Simplify to get the solution.
$x = 15$	

Check:

$\mathbf{x + 16 = 31}$	Write the equation.
$(15) + 16 = 31$	Replace **x** with the solution.
$31 = 31$ ✓	If the final sentence is true, the solution is correct.

The answer is: $x = 15$.

Here is an example that uses the **addition property of equality**.

Example 4

Solve n – 5.8 = 12.3. Check your answer.

n – 5.8 = 12.3	Write the equation.
n – 5.8 + 5.8 = 12.3 + 5.8	Add 5.8 to both sides.
0 18.1	Simplify to get the solution.
n = 18.1	

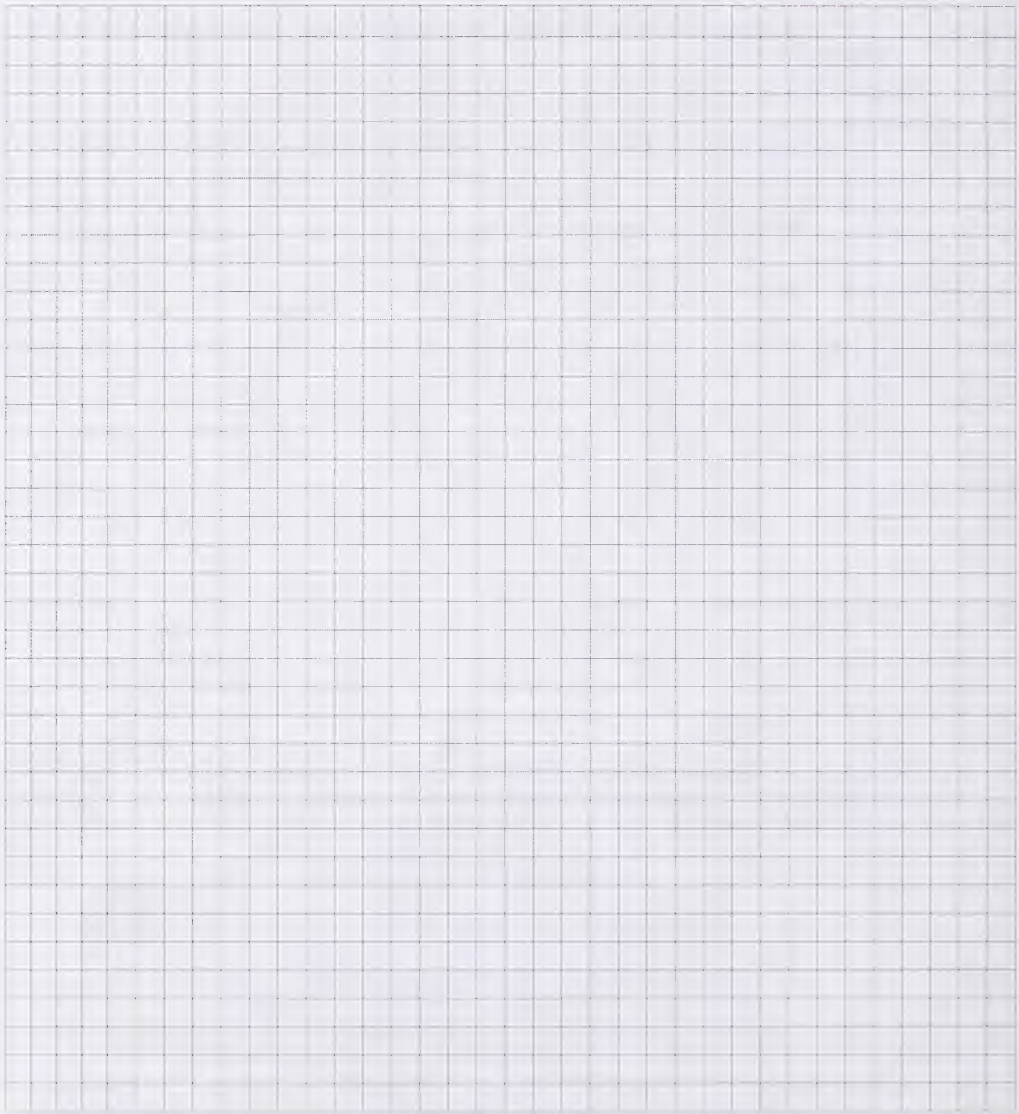
Check:

n – 5.8 = 12.3	Write the equation.
(18.1) – 5.8 = 12.3	Replace **n** with the solution.
12.3 = 12.3 ✓	If the final sentence is a true, the solution is correct.

The answer is: n = 18.1.

Let's Practice

- Go online to complete the Concept Capsule: Problem Solving Using Addition Equations.
- Go online to watch the Notepad Tutor Lesson: Problem Solving Using Subtraction Equations.
- Turn in your Workbook to Unit 2, Lesson 6 and complete 1 to 25.



Lesson 7

Writing a Multiplication or Division Equation

Tiger Salamander

The tiger salamander is common in southern Alberta. You can identify this salamander by the netlike pattern on their skin. This salamander has a broad head and a stout body. These salamanders live on ground and like the water.

The north-western salamander is found in Alberta as well. It has a golden brown colour to its body. These salamanders prefer the water but also dwell on land.

Many people keep salamanders as pets in aquariums. They have to study what the amphibians eat, how to create the proper environment and how to care for their health.

Nina has salamanders in an aquarium at home. Two times the number of her tiger salamanders is 18.

You can write an equation for the following situation.

In words: Two times the number of salamanders is 18.

Variable: n = number of salamanders

Equation: 2n = 18

Reflection

How would you find the number of salamanders now that you know the equation?

Objectives for this Lesson

In this lesson you will explore the following concepts:

- Develop and justify equations that illustrate the commutative property of multiplication
- Identify the unknown in a problem
- Represent the problem with an equation
- Create a problem for a given equation

- Go online to complete the Concept Capsule: Problem Solving Using Concrete Models (Multiplying and Dividing).

Multiplication and Division Equations

A **multiplication equation** has the operation of multiplication on one side:

In words: Six times a number is eighteen.

Equation: $6n = 18$

The **commutative property of multiplication** allows you to write the equation in different ways:

6n = 18 OR n(6) = 18

The value of **n** is the same for both of these equations.

The commutative property of multiplication allows you to multiply numbers in any order. Using this property, the product will remain the same.

4 x 3 = 3 x 4

A **division equation** has the operation of division on one side:

In words: A number divided by six is four.

Equation: $\frac{n}{6} = 4$

Example 1

Write an equation for: Five times a number equals thirty-five.

Identify the numbers:

Five times a number equals thirty-five.
5 **35**

Identify the variable:

Five times a number equals thirty-five.
5 **n** **35**

Use any letter

Identify the symbols:

Five times a number equals thirty-five.
5 **•** **n** **=** **35**

The left side of this equation can be written as **5n** or **n • 5** due to the commutative property of multiplication.

The equation is: **5n = 35**

There are many ways to write multiplication equations that have the same meaning for the variable.

A number times three is fifteen	
n • 3 = 15	3n = 15
15 = n • 3	15 = 3n

With division equations this is not true.

Reflection

Why are there less ways to write a division equation than a multiplication equation?

Example 2

Write an equation for the sentence:

Identify the numbers:

The quotient of a number and five is six.

5 6

Identify the variable:

The quotient of a number and five is six.

b 5 6

Identify the symbols:

The quotient of a number and five is six.

b ÷ 5 6

This applies to the following numbers in order.

The equation is: **b ÷ 5 = 6**

When two values follow the words "the quotient of" you will divide the first value by the second value.

Another way to express division is using a fraction bar:

b divided by **5** is: $\frac{b}{5}$

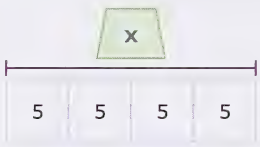
This is a very common way to write division once you begin to use variables.

Let's Explore

Exploration 1: Division Equations

Materials: Unit 2, Lesson 7, Exploration 1 page in your Workbook, Pencil

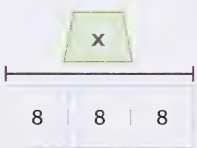
1. Observe the following:



This picture models two equations.

$\frac{x}{4} = 5$ OR $\frac{x}{5} = 4$

2. Write two equations to represent the following model:



3. Create a model for $\frac{x}{6} = 2$.

4. Create a model for $\frac{x}{8} = 7$.

For 5: Either record an oral description or write one in your Workbook. If recording, follow the recording instructions in your Workbook

5. Reflect: Describe how you would find **x** using your models.

Let's Practice

- Go online to watch the Notepad Tutor Lesson: Writing Equivalent Forms of a Given Equation.

- Turn in your Workbook to Unit 2, Lesson 7 and complete 1 to 18.

Word Problems

There are many strategies you can use to solve word problems. It is good to use multiple strategies when problem solving. For this lesson you will not solve the problem. You will write equations for these word problems. You will write an equation with a variable to represent the solution. It is not about getting the solution right now.

Example 3

Write an equation for the following word problem.

The width of a wall is three times its height.
The width of the wall is 327 metres. What is its height?

Use a picture model:

This model shows you that the width is 3 times as long as the height.

Use the first sentence to write a word model:

The width of a wall is three times its height.

327 = 3 • h

An equation is: **327 = 3h**

Let's Practice

- Turn in your Workbook to Unit 2, Lesson 7 and complete 19 to 25.

Lesson 8

Solving a Multiplication or Division Equation

Making Money

Many jobs pay you based on the number of hours that you work. If you are paid at a rate of $12 per hour and you work 8 hours you will make $12 • 8 = $96. Some jobs give you a bonus for working more than 40 hours in one week. There are many things to consider when looking for a job. The amount you will be paid takes some calculation.

Ms. Chong works for an auto parts store. She makes $10.85 per hour and works the same number of hours each week. If she makes $379.75 each week, how many hours does she work?

The variable: h = number of hours Ms. Chong works

The equation: 10.85h = 379.75

The solution: h = 35

Ms. Chong works 35 hours each week.

To solve this equation you would use the division property of equality. You will learn how to use this property in this lesson.

Reflection

What is the inverse operation of division?

Objectives for this Lesson

In this lesson you will explore the following concepts:

- Model the preservation of equality for multiplication and division equations
- Model multiplication and division equations
- Solve multiplication and division equations

- Go online to watch the Notepad Tutor Lesson: Multiplication Equations.

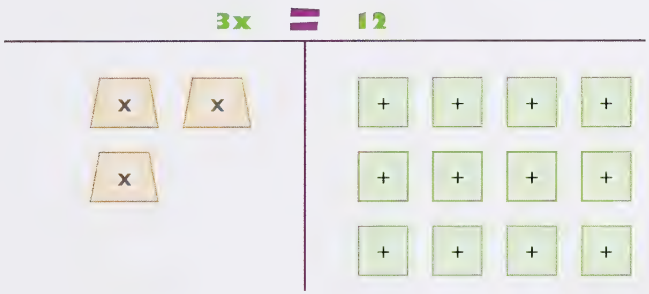
Modelling Equations

You can use Algebra Tiles to model multiplication equations. You can use the models to help you solve when the numbers are small enough to work with.

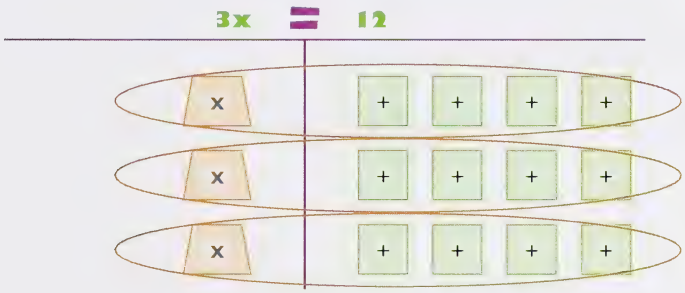
Example 1

Solve 3x = 12 using Algebra Tiles.

Make the model:



Match each **x** tile with the same number of 1 tiles:



This model shows you that each **x** has a value of 4.

The answer: **x = 4**

- Go online to watch the Notepad Tutor Lesson: Division Equations.

Lesson 8: Solving a Multiplication or Division Equation

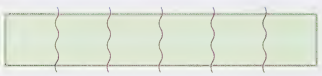
You can use pictures to model division equations.

Example 2

Solve $\frac{h}{6} = 4$ using a picture.

Make a rectangle to represent the variable:

Divide the rectangle into 6 equal pieces with lines. This represents h divided by 6:



Label each new part with the right side of the equation, 4:

You now have six 4s. That is the same as having 4 x 6 = 24.

The answer is: **h = 24**

Lesson 8: Solving a Multiplication or Division Equation

Let's Explore

Exploration 1: Solving Equations

Materials: Unit 2, Lesson 8, Exploration 1 page in your Workbook, Algebra Tiles from the back of this unit in your Workbook, Scissors, Pencil

1. Cut out the Algebra Tiles. Model $5x = 15$ using Algebra Tiles. Solve the equation.
2. What value does **x** represent in $5x = 15$?
3. Model $5x = 15$ and multiply each side by 2.
4. What value does **x** represent?
5. Complete: If you multiply both sides of an equation by the same number, the value of the _____ remains the same.
6. Model $\frac{x}{3} = 6$. Draw a picture and solve the equation.
7. Create a model of a division equation. Write the equation and draw the model.
8. Complete: When solving a division equation, you _____ both sides of the equation by the same number.

Properties of Equality

When solving multiplication equations you can use the **division property of equality**.

Division Property of Equality	
You can **divide** both sides of an equation by the same number without changing the value of the variable.	$6x = 18$ $\frac{6x}{6} = \frac{18}{6}$ $x = 3$

Lesson 8: Solving a Multiplication or Division Equation

Division is the inverse operation of multiplication. It will make the left side of the equation equal to **x** and the right side will be your answer.

To solve division equations you can use the **multiplication property of equality**.

Multiplication Property of Equality	
You can **multiply** both sides of an equation by the same number without changing the value of the variable.	$\frac{x}{10} = 8$ $\frac{x}{10} \cdot 10 = 8 \cdot 10$ $x = 80$

Multiplication is the inverse operation of division. It will make the left side of the equation your variable and the right side will be your answer.

Example 3

Solve $12x = 84$. Check your answer.

$12x = 84$	Write the equation.
$\frac{12x}{12} = \frac{84}{12}$	Divide both sides by 12. 12 ÷ 12 on the left becomes 1 84 ÷ 12 on the right becomes 7
$x = 7$	Answer.

Check:

$12x = 84$	Replace **x** with 7 in the original equation.
$12(7) = 84$	
$84 = 84$ ✓	True statement means your answer is correct.
The answer is:	$x = 7$

Example 4

Solve $\frac{g}{15} = 8$. Check your answer.

$\frac{g}{15} = 8$	Write the equation.
$\frac{g}{15} \cdot 15 = 8 \cdot 15$	Multiply both sides by 15. Since $15 \div 15 = 1$, the right side becomes **g**. The left becomes $8 \cdot 15$.
$g = 120$	Answer.

Check:

$\frac{g}{15} = 8$	Replace **g** with the answer in the original equation.
$\frac{(120)}{15} = 8$	
$8 = 8$	True statement means your answer is correct.
The answer is:	$g = 120$

Let's Practice

- Turn in your Workbook to Unit 2, Lesson 8 and complete 1 to 24.

- Go online to complete the Concept Capsule: Solving Equations Using Preservation of Equality.

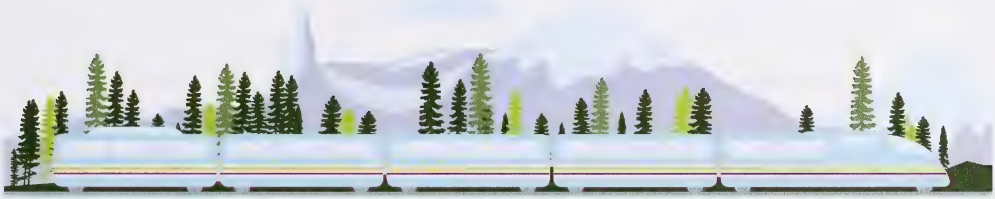
Lesson 9

Writing Equations for a Table of Values

Travelling by Train

The Canada Express is a train that takes passengers from Toronto to Vancouver. This is a 3 345 km trip across Canada. The train stops in Edmonton, Alberta and then travels through the Rocky Mountains.

Lian is travelling on the Canada Express with her aunt. The train has travelled 120 km after the first hour of travel. After one and a half hours of travel the train has travelled 180 km. How far will the train have travelled in three hours if it continues travelling at this speed?



Hours	0.5	1	1.5	2	2.5	3
Distance (km)	60	120	180	240	300	360

Lian is able to tell that the train will travel 360 km in 3 hours if the train continues at this speed. She found this out by completing the pattern in a table of values.

Reflection

How can you use a table of values to find the solution to a problem?

Objectives for this Lesson

In this lesson you will explore the following concepts:

- Generate values in a table of values
- Formulate a rule to describe the relationship between two columns of numbers in a table of values
- Create a table of values to record and reveal a pattern to solve a given problem

Completing a Table of Values

There are a lot of ways to solve mathematical problems. One strategy is to create a table of values to find a solution. You need to be able to generate the missing values in a table by following a rule.

Example 1

Use the rule to find the missing values in the table.

n	6n
0	
1	
2	
3	
4	
5	

The rule is found in the second column. Substitute **n** with the value in the first column:

n	Work	6n
0	6(0) =	0
1	6(1) =	6
2	6(2) =	12
3	6(3) =	18
4	6(4) =	24
5	6(5) =	30

The final answer will look like:

n	6n
0	0
1	6
2	12
3	18
4	24
5	30

Sometimes rules may have more than one step. You will use order of operations to generate the values for these rules.

Example 2

Use the rule to find the missing values in the table.

b	52 - 4b
3	
5	
8	
11	
12	

Replace the variable with each value. Use order of operations to find the value of the answer. You can do this outside of the table on your own paper.

52 – 4b

b = 3: $52 - 4(3)$
$= 52 - 12$
$= 40$

b = 5: $52 - 4(5)$
$= 52 - 20$
$= 32$

b = 8: $52 - 4(8)$
$= 52 - 32$
$= 20$

b = 11: $52 - 4(11)$
$= 52 - 44$
$= 8$

b = 12: $52 - 4(12)$
$52 - 48$
$= 4$

Now put the values in the table:

b	52 - 4b
3	40
5	32
8	20
11	8
12	4

Reflection

As the values for **b** grow larger, the values in the second column get smaller. Why?

Writing Rules

Now you have seen how to generate values using a rule in a table. You should also be able to find the rule for a given table. Think of the four operations and how they change numbers.

Let's Explore

Exploration 1: Describe the Change

Materials: Unit 2, Lesson 9, Exploration 1 page in your Workbook, Pencil

1. Perform the following operations.

3 + 5 = ___	16 + 5 = ___	20 + 5 = ___	32 + 5 = ___
40 + 5 = ___	51 + 5 = ___	63 + 5 = ___	68 + 5 = ___

2. Does adding a counting number increase or decrease the value of the first number?

3. Perform the following operations.

20 − 8 = ___	24 − 8 = ___	35 − 8 = ___	37 − 8 = ___
49 − 8 = ___	58 − 8 = ___	64 − 8 = ___	72 − 8 = ___

4. Does subtracting a counting number increase or decrease the value of the first number?

5. Perform the following operations.

4 • 3 = ___	7 • 3 = ___	9 • 3 = ___	12 • 3 = ___
15 • 3 = ___	19 • 3 = ___	23 • 3 = ___	27 • 3 = ___

6. Does multiplying by a counting number increase or decrease the value of the first number?

7. Perform the following operations.

$24 \div 2 =$ ___ $34 \div 2 =$ ___ $42 \div 2 =$ ___ $68 \div 2 =$ ___

$86 \div 2 =$ ___ $94 \div 2 =$ ___ $98 \div 2 =$ ___ $102 \div 2 =$ ___

8. Does dividing by a counting number increase or decrease the value of the first number?

9. Record your observations about operations with whole numbers:

Addition of a whole number:	Subtraction of a whole number:
Multiplication by a whole number:	**Division by a whole number:**

You can use the observations you made about operations with whole numbers to find the rule in a table of values.

Example 3

Write a rule for the second column of the table in symbols and in words.

n	☐
4	20
6	30
8	40
10	50
12	60

Is there an increase or a decrease from the value in the first column to the value in the second column?

n		□
4	<	20
6	<	30
8	<	40
10	<	50
12	<	60

Since there is an increase you know you will add or multiply.

Test your two possibilities. Use the first term in the **n** column:

n	Work	□
4	(4) + 16	20
6		30
8		40
10		50
12		60

n	Work	□
4	5(4)	20
6		30
8		40
10		50
12		60

Does your rule work on the rest of the terms?

n	Work	☐
4	(4) + 16	20
6	~~(6) + 16~~	30
8	~~(8) + 16~~	40
10	~~(10) + 16~~	50
12	~~(12) + 16~~	60

n	Work	☐
4	5(4)	20
6	5(6)	30
8	5(8)	40
10	5(10)	50
12	5(12)	60

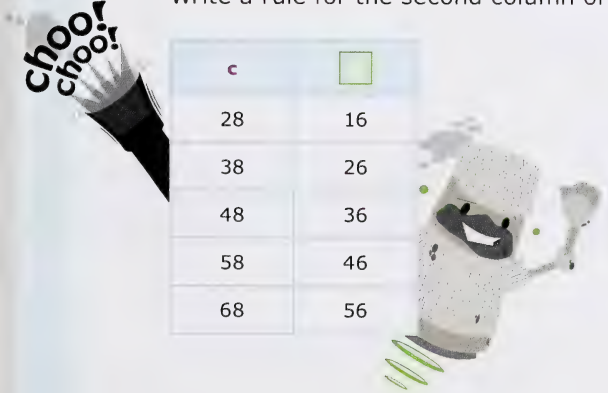
Now you can write the rule:

In symbols: **5n**

In words: **the product of n and 5** or **5 multiplied by n**

Example 4

Write a rule for the second column of the table in symbols and in words.



c	☐
28	16
38	26
48	36
58	46
68	56

The value in the second column is less than the input value of the first column. Is the rule subtraction or division?

Try subtraction:

c	□	
28	16	⟵(28) – 12 = 16
38	26	⟵(38) – 12 = 26
48	36	⟵(48) – 12 = 36
58	46	⟵(58) – 12 = 46
68	56	⟵(68) – 12 = 56

Since this works for each value you do not need to try division.

The rule is:

In symbols: **c – 12**

In words: **twelve less than c or c minus twelve**

Let's Practice

- Turn in your Workbook to Unit 2, Lesson 9 and complete 1 to 15.

Problem Solving with a Table of Values

The problem solving strategy of creating a table of values helps you to picture the problem. You can use the table to find the pattern. Once you know the pattern you can write a rule to solve for any value of the problem.

Example 5

Solve the problem using a table of values. Draw your table and write the answer.

Cameron is saving money. He opens his account with $50. He deposits $15 each month after the month he opened the account. After one month he had $65 and after two months he had $80. How much money will Cameron have after 6 months?

Create a table:

Month	0	1	2	3	4	5	6
Savings	50	65	80				

This table records the given information. You can complete the table using the information in the word problem or the pattern in the table.

In the word problem you read: "He deposits $15 each month..."

The pattern in the table reflects that statement in the second row:

Month	0	1	2	3	4	5	6
Savings	50	65	80	95	110	125	140

Cameron will have saved $140 after 6 months.

Let's Practice

- Go online to complete the Concept Capsule: Problem Solving Using a Table of Values.

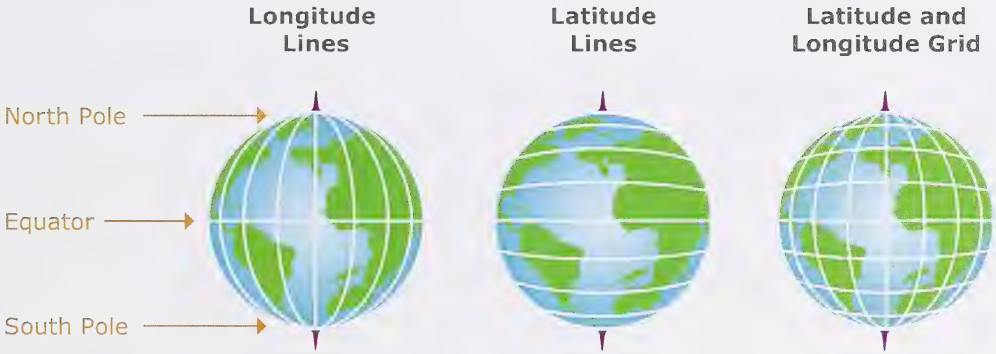
- Turn in your Workbook to Unit 2, Lesson 9 and complete 16 to 20.

Lesson 10

Graphing Points on the Coordinate Plane

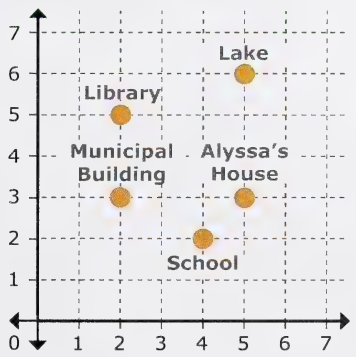
Reading Maps

In the middle ages a system was developed to find the location of specific places on the Earth's surface. The system is a grid that covers the Earth in lines of latitude and longitude. The lines of latitude are horizontal and run parallel to one another. Longitude lines run vertically and are not parallel because they all join together at the North Pole and the South Pole.



Alyssa creates a map of locations in her town on a grid for a geography project.

The coordinates of her house are (5, 3). The location of the library can be described by the ordered pair (2, 5).



You will learn how to identify points on a coordinate plane, or grid in this lesson.

Reflection

How would you describe the location of the lake on Alyssa's grid?

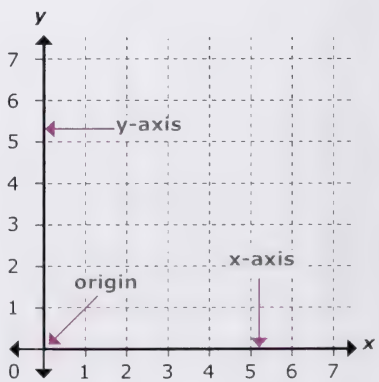
Objectives for this Lesson

In this lesson you will explore the following concepts:

- Label the axes of a coordinate plane
- Label the origin of a coordinate plane
- Plot a point in the coordinate plane
- Plot points in the coordinate plane with various intervals

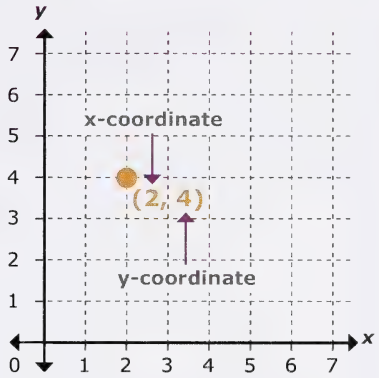
The Coordinate Plane

A **coordinate plane** is formed by the intersection of two number lines. They intersect at zero on each line and this point is called the **origin**. The horizontal line is called the **x-axis**. The vertical line is called the **y-axis**.



The coordinate plane is used to locate points. The location of each point is named using an **ordered pair**. The ordered pair has two numbers. The first number is the **x-coordinate** and the second number is the **y-coordinate**.

The x-coordinate names the value that corresponds to the x-axis. The y-coordinate names the value that corresponds to the y-axis. You do not name the x and y coordinates in the opposite order.



Example 1

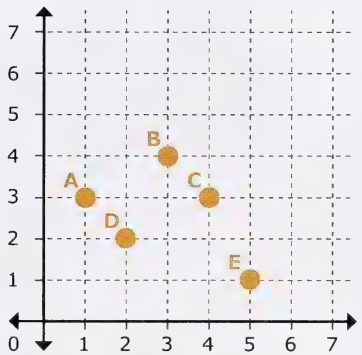
Write the letter name for the ordered pair (4, 3).

The x-coordinate is 4.

The y-coordinate is 3.

Start at the origin. Move 4 units right along the x-axis and then move 3 units up along the y-axis.

Tha answer is C.



Example 2

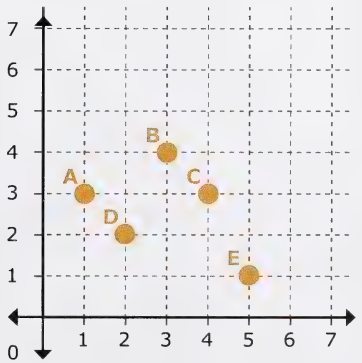
Name the ordered pair for the letter A on the coordinate plane.

Start at the origin.

Move 1 unit right along the x-axis.

Move 3 units up along the y-axis.

The answer is (1, 3).



Example 3

Graph the point (3, 5) on the coordinate plane.

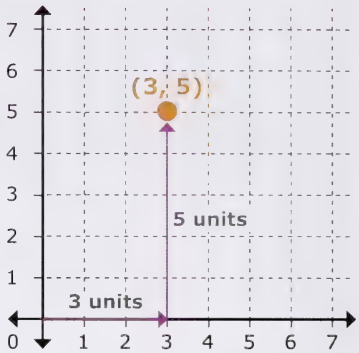
Start at the origin.

Count 3 units right along the x-axis.

Count 5 units up along the y-axis.

Mark a point at this location.

Label your point with the ordered pair (3, 5).



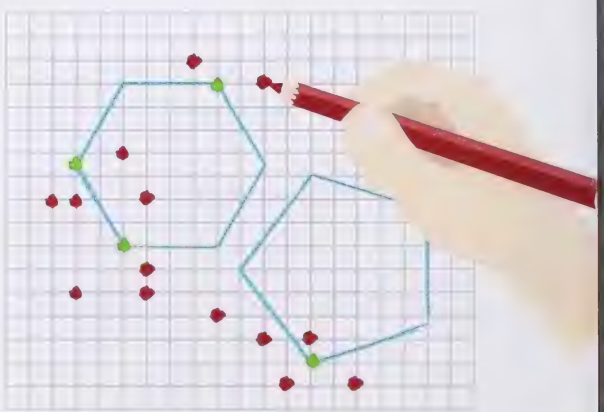
Let's Explore

Exploration 1: Hit or Miss

Materials: Unit 2, Lesson 10, Exploration 1 page in your Workbook, Coordinate Plane page from the back of this unit in your Workbook, 2 Pencil Crayons, Partner

Choose a partner. You will play a game using the Coordinate Plane in your Workbook. You will each need one Coordinate Plane.

1. Player A draws a pentagon and a hexagon on the coordinate plane. These shapes do not need to have sides of the same length.
2. Player B names an ordered pair on the coordinate plane.
3. Player A says "Hit" if the point is a vertex of one of the shapes. If it is not, then say "Miss".



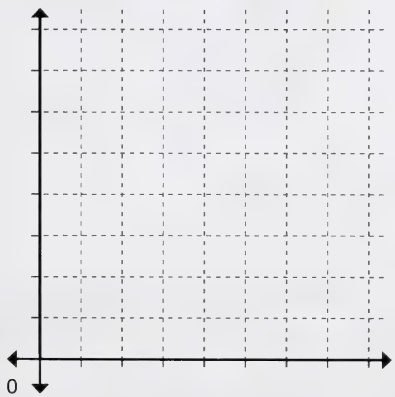
4. Player B marks the point with one colour for a hit and a different colour for a miss.
5. Count the number of guesses Player B needs to find all vertices of both shapes.
6. Continue play by switching roles. The winner is the player that names all of the points of the figures with the smallest number of guesses.

Changing Intervals

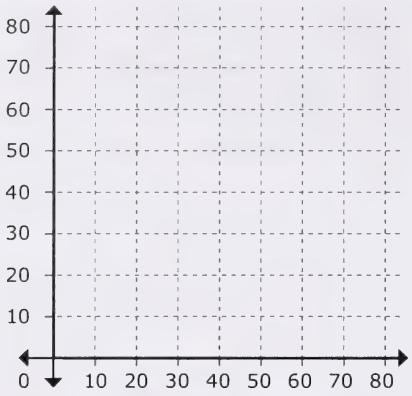
Some ordered pairs may have very large coordinates. You can change the **scale** on your axes to graph a point on a coordinate plane. When you count spaces you will have to pay close attention to the scale. The scale must have the same interval between each mark.

Example 4

Graph the point (35, 50) on the coordinate plane. Choose a scale of 2, 5, or 10 to mark the x-axis and y-axis.



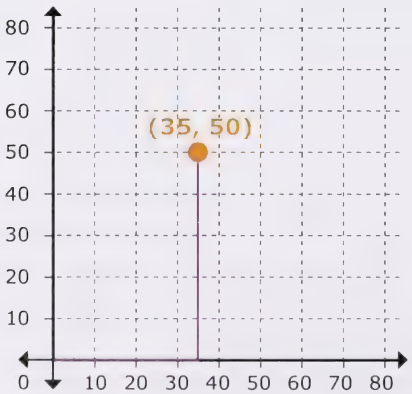
The coordinate plane given has eight lines on each axis. You need to use a scale of 10 to make your points fit.



Graph the ordered pair.

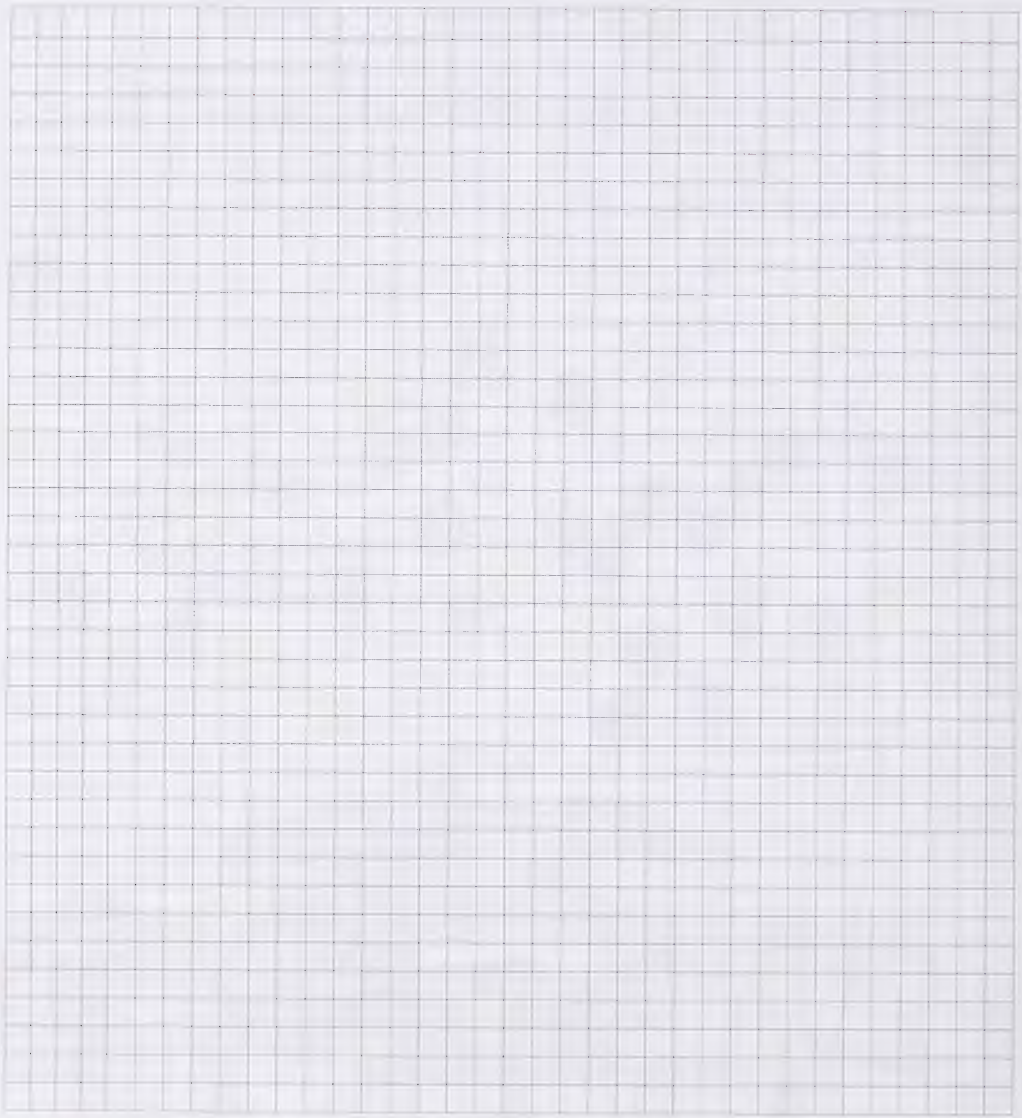
Move to 30 along the x-axis and then half way to the 40.

From this place, move up to the 50 along the y-axis.



Let's Practice

- Go online to complete the Concept Capsule: The Basics of Plotting Points on a Cartesian Plane.
- Turn in your Workbook to Unit 2, Lesson 10 and complete 1 to 32.



Lesson 11

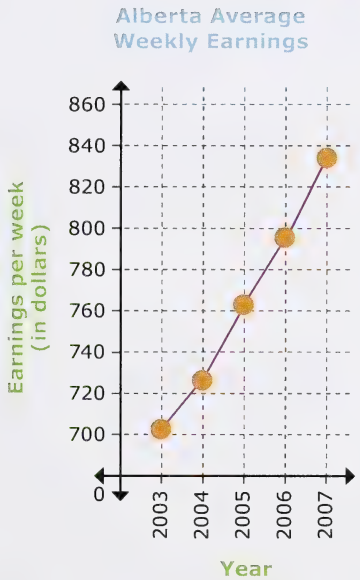
Graphing Patterns

Weekly Earnings

There are many industries and enterprises that employ people. People earn salaries for working jobs in these industries. The average weekly earnings of employees in Alberta, Canada are shown in the line graph below.

The weekly income increased every year from 2003 to 2007 based on this data. The points of the line graph appear to grow higher from left to right. This tells you that the earnings are increasing. If the points of a line graph go down from left to right then there is a decrease.

In this lesson you will learn how to interpret data in line graphs.



Reflection

Why do you think line graphs are used to make observations about data over time?

Objectives for this Lesson

In this lesson you will explore the following concepts:

- Graph a table of values from a given pattern
- Describe the relationship shown on a graph
- Create a line graph from a given table of values or a given set of data

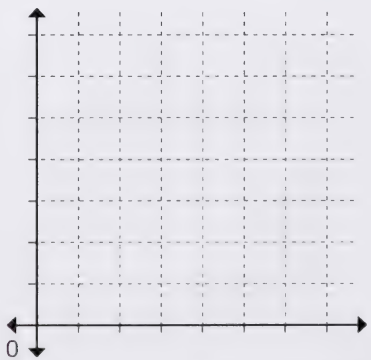
Graphing a Table of Values

A table of values can be used to make a graph. The values in the table are ordered pairs for the graph.

Example 1

Create a graph for the table of values.

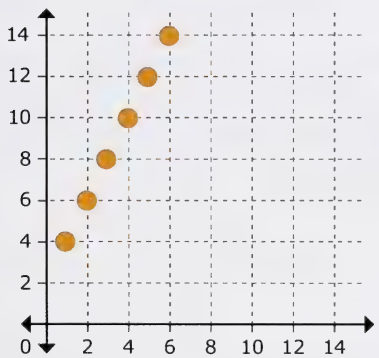
x	y
1	4
2	6
3	8
4	10
5	12
6	14



The table shows a list of x-coordinates and y-coordinates that make ordered pairs.

x	y	
1	4	⟼ (1, 4)
2	6	⟼ (2, 6)
3	8	⟼ (3, 8)
4	10	⟼ (4, 10)
5	12	⟼ (5, 12)
6	14	⟼ (6, 14)

The values for **x** are smaller than 10. The values for **y** range from 4 to 14. Your graph should have a scale of 2 to accommodate the values. Label the scale on the coordinate plane and graph the points.

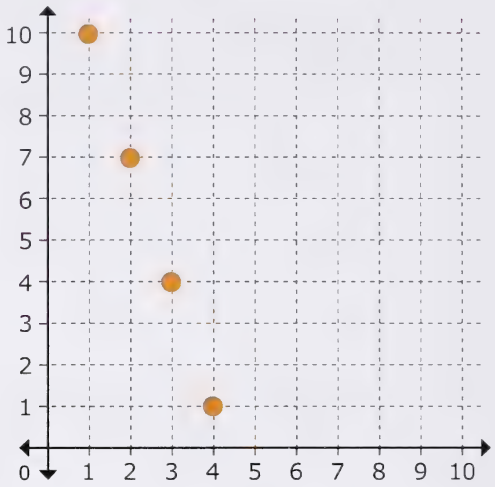


Your ability to read ordered pairs on a coordinate plane will help you interpret graphs. Find the points on the given graph.

Example 2

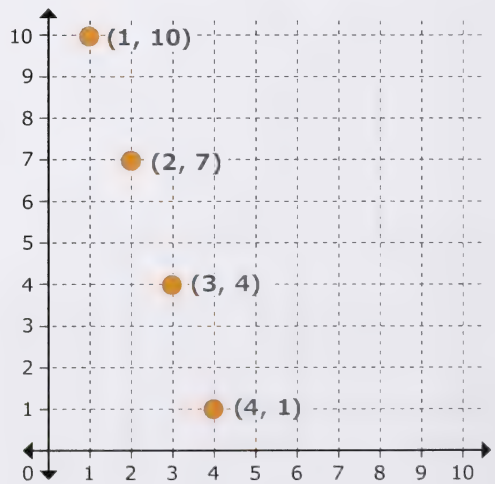
Create a table of values for the given graph.

x	y



Simply name each ordered pair on the graph and put the values in the table:

x	y
1	10
2	7
3	4
4	1



You can create a table of values from a word problem. The next step is being able to interpret a pattern in a graph. You can do this by graphing the table of values on a coordinate plane.

Sometimes you will have to adjust a scale to fit your values.

Example 3

Zach is playing a video game. He earns 12 points for each round he wins. Create a table of values that shows the number of points he earns for up to 8 rounds.

Create a table for the given information:

Rounds	1	2	3	4	5	6	7	8
Points	12							

Complete the table using the information.

Rounds	1	2	3	4	5	6	7	8
Points	12							

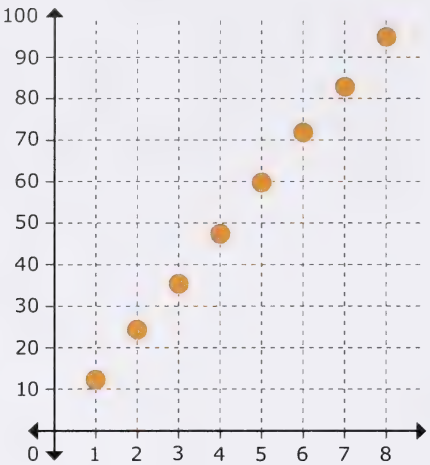
Add 12 to generate the values in the table:

Rounds	1	2	3	4	5	6	7	8
Points	12	24	36	48	60	72	84	96

Graph the table of values. The number of rounds represents the x-coordinates and the number of points represents the y-coordinates. The ordered pairs in the table of values are:

(1, 12), (2, 24), (3, 36), (4, 48), (5, 60), (6, 72), (7, 84), (8, 96)

To graph these values you will need to change the scale on the y-axis. Use a scale of 10 until it reaches 100. The x-axis scale can remain 1 since the values are all under 10.
Graph the points:



As you can see, there is a pattern formed in this graph.

- Go online to complete the Concept Capsule: Tables of Values and Graphs.

Line Graphs

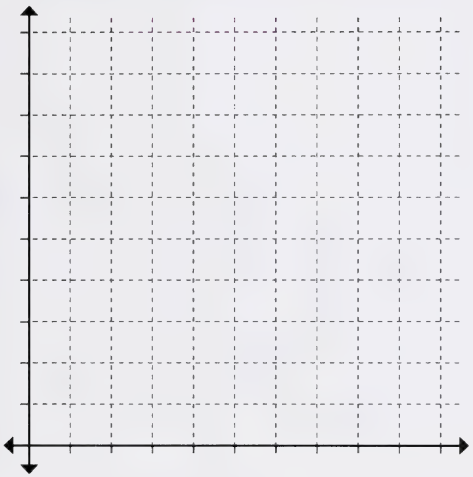
Line graphs show trends over time. They are often used to make predictions for the future. The x-axis is used to record the time and the y-axis will show the value being tracked.

You can create a line graph using data that is provided, or by researching your own data.

Example 3

Create a line graph for the given set of data on the coordinate plane.

Year	1985	1990	1995	2000	2005
Festival Attendance (in Thousands)	19	16	15	8	12



Decide on the interval for the axes:

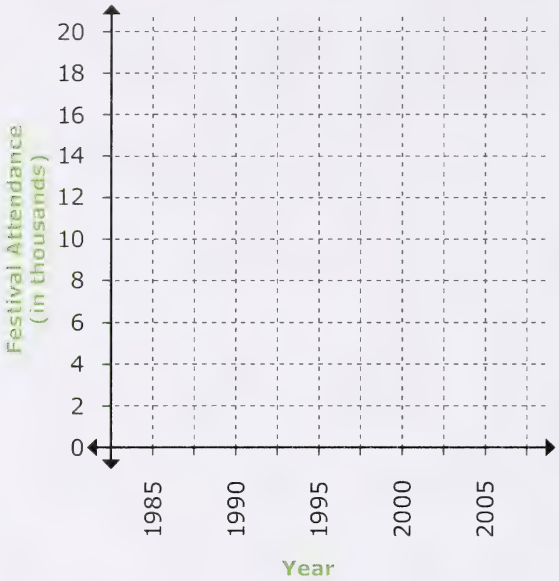
The x-axis of the coordinate plane will represent the year values and the y-axis will represent festival attendance.

You have ten marks on the x-axis so put a year from your data on every other mark. The x-axis should start with the first year given rather than 0.

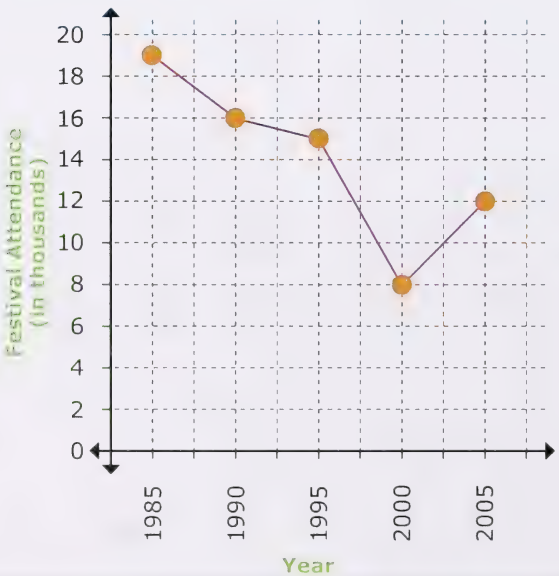
Use a scale of 2 on the y-axis in order to make sure every value fits the plane.

Label the horizontal and vertical axes:

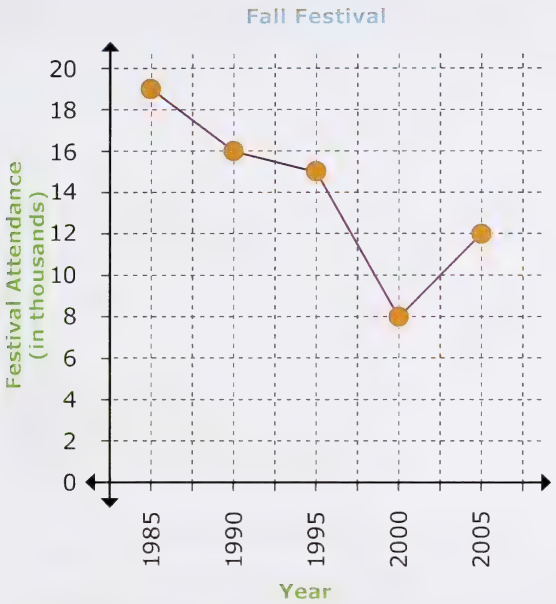
Since this is a line graph you must label both axes to describe the values that are graphed.



Draw and connect the points on the line graph:



Title your graph:



You can use your graph to make observations about the data.

Reflection

What observations can you make about the attendance of the Fall Festival over the twenty years shown?

Let's Explore

Exploration 1: Making a Line Graph

Materials: Unit 2, Lesson 11, Exploration 1 page in your Workbook, Clock, Pencil

Record for one week the amount of time, in hours, that you sleep. Measure the time as closely as you can to a quarter of an hour and record the time in hours and quarter hours:

Examples: 1 hour 15 min = 1.25 hr

1 hour 30 min = 1.5 hr

1 hour 45 min = 1.75 hr

Day					
Hours of Sleep					

Create a line graph using your data. Make sure you include the following elements on your graph:

1. Axes labels with the appropriate units
2. Axes names with a description of the data
3. A title for the graph

Let's Practice

- Turn in your Workbook to Unit 2, Lesson 11 and complete 1 to 14.

Lesson 12

Measuring Figures on a Coordinate Plane

Embroidery in Cultures around the World

One of the oldest forms of embroidery is cross-stitch. Many countries have a history of making clothing and art work that is covered with beautifully embroidered patterns.

Ukraine: Women's traditional dress is covered with embroidery.

England and France: Two versions of the Bayeux Tapestry exist and are on display in France and England. The tapestry was created to tell the story of the invasion of England by the Normans in 1066.

Nina and Cameron are making a cross-stitch pattern for their class to give to their teacher. They draw their design on graph paper so that it can be transferred to the cloth with thread. Here is the beginning of their design:

Reflection

Why do you think Nina and Cameron chose to make their design on a coordinate plane?

Objectives for this Lesson

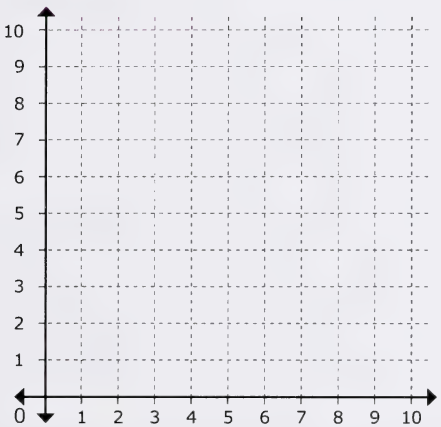
In this lesson you will explore the following concepts:

- Draw shapes or designs on a coordinate plane
- Determine the distance between points on a coordinate plane

Designs on a Coordinate Plane

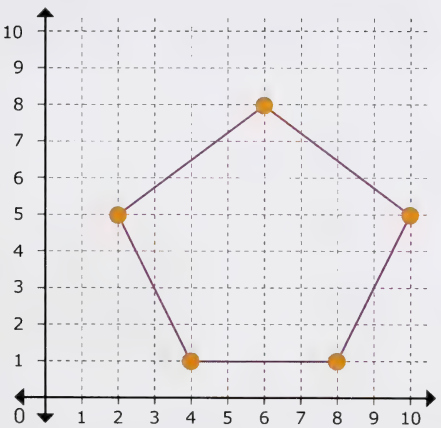
You can make figures on a coordinate plane. The points of a figure can be listed in order and you must connect the dots in the proper order to see the shape.

Example 1



Graph the points in the given order and connect the dots. What is the shape of your picture?

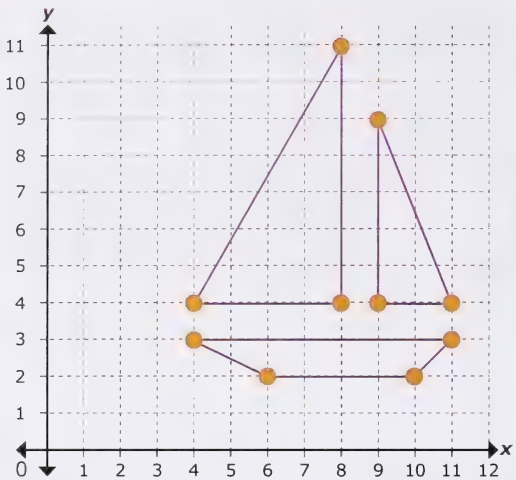
Start: (2, 5), (6, 8), (10, 5), (8, 1), (4, 1), (2, 5) Stop



Graph the points connecting them as you go with a line segment:

Name the shape on the coordinate plane: With five sides the shape is a **pentagon**.

Example 2



Graph the points and draw a line segment between each pair of consecutive points to complete a picture.

Start: (4, 4), (8, 11), (8, 4), (4, 4) Stop

Start: (9, 9), (11, 4), (9, 4), (9, 9) Stop

Start: (3, 3), (5, 2), (10, 2), (11, 3), (3, 3) Stop

Let's Explore

Exploration 1: Pictures on a Coordinate Plane

Materials: Unit 2, Lesson 12, Exploration 1 page in your Workbook, Pencil

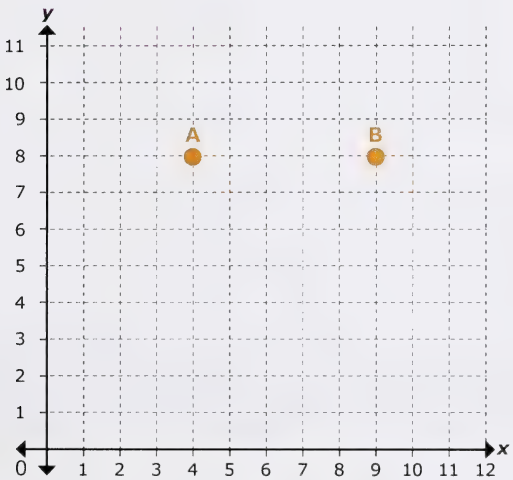
1. Create your own drawing on the coordinate plane.
2. Put points around the perimeter of your figure.
3. List all of the ordered pairs that make the figure.
4. Have a friend make the figure using only the directions you have written with ordered pairs.

Hint: Be sure to write "start" and "stop" if there are places where the pencil must be lifted.

Measuring Distance on a Coordinate Plane

You can also use properties of geometric figures to help you complete the figures on a coordinate plane. You will need to know how to find distance in order to draw figures with certain properties.

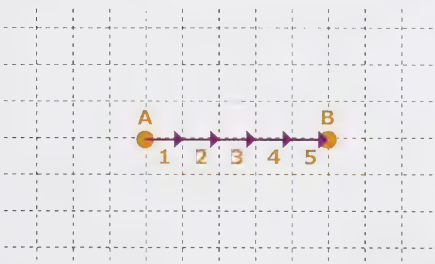
Example 3



Find the distance from Point A to Point B.

List the points:
A (4, 8) and B (9, 8)

This method works because the points have the same y-coordinate. It will also work if the points have the same x-coordinate.

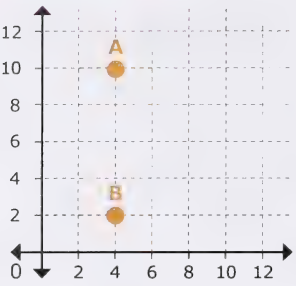


Count the spaces between the points horizontally:

The distance from Point A to Point B is **5 units**.

The distance between two points on a coordinate plane also depends on the scale.

Example 4



Find the distance from Point A to Point B.

List the points: (4, 10) and (4, 2)

Count the number of spaces between the points: 4 spaces

Multiply the number of spaces by the scale on the y-axis: 4(2) = 8

The distance between the points is **8 units**.

You can also use a simple **algorithm** to find the distance between two points.

Let's Explore

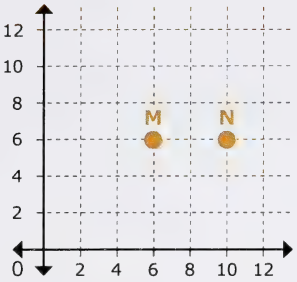
Exploration 2: Finding the Distance

Materials: Unit 2, Lesson 12, Exploration 2 page in your Workbook, Pencil

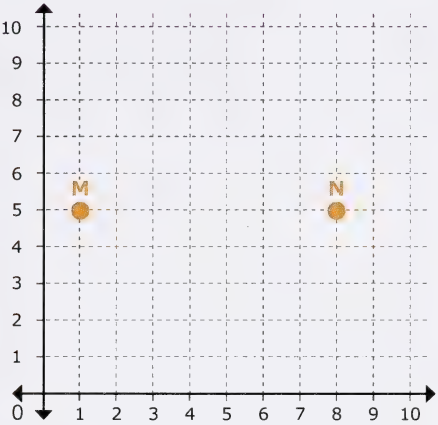
Horizontal distance:

1. List the ordered pair for each point.
2. Find the distance between each pair of points on the coordinate plane.

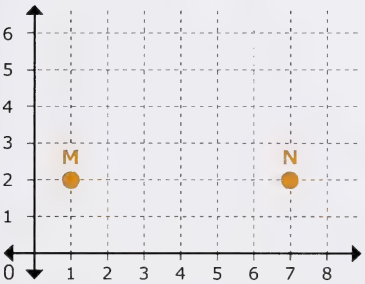
A.



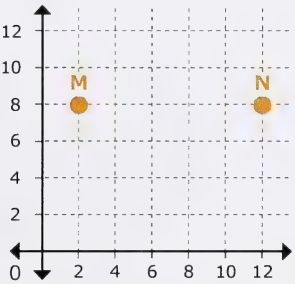
B.



C.



D.



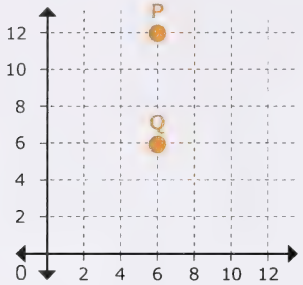
3. Use the table to write a prediction of how to find the distance between points horizontally using only ordered pairs.

Vertical distance:

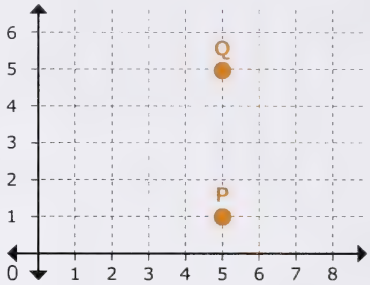
4. List the ordered pair for each point.

5. Find the distance between each pair of points on the coordinate plane.

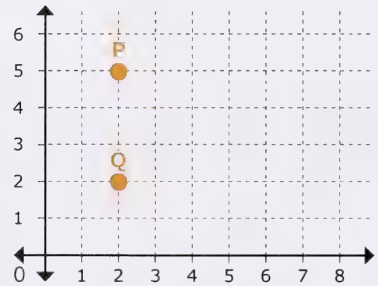
E.



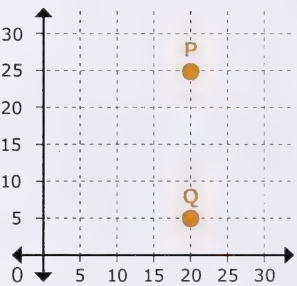
F.



G.



H.

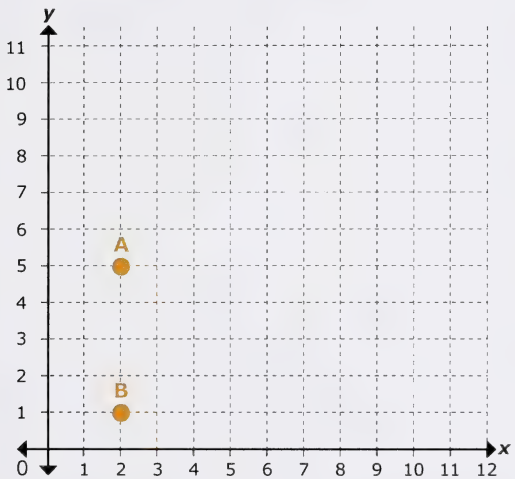


6. Use the table to write a prediction of how to find the distance between points vertically using only ordered pairs.

You can use the distance between two points to complete figures on a coordinate plane.

Example 5

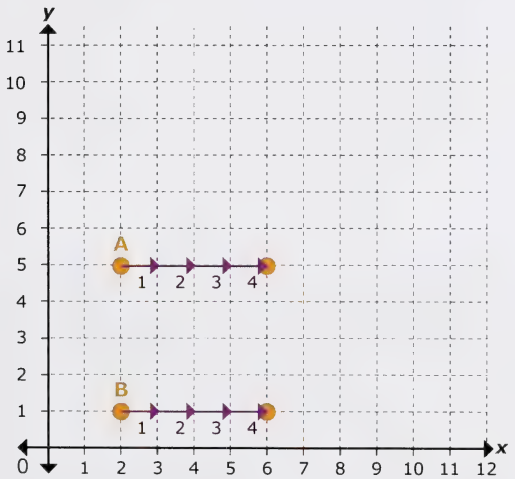
Nina graphed the points shown on the coordinate plane. She wants to make a square. Graph and label the two points needed and complete the square.



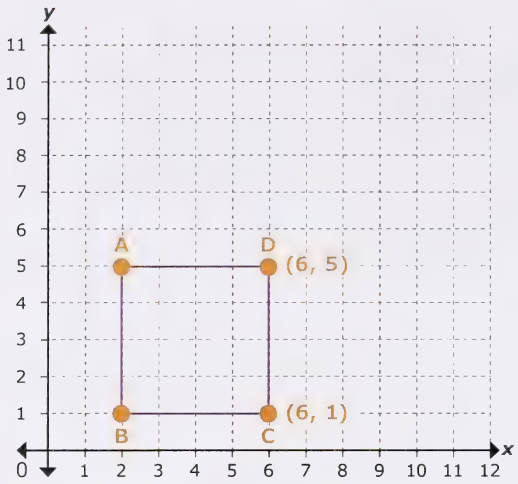
A square has four sides that are the same length.

Find the distance between the two given points: 4 units

Use the distance to locate a point along the horizontal axis from each original point.



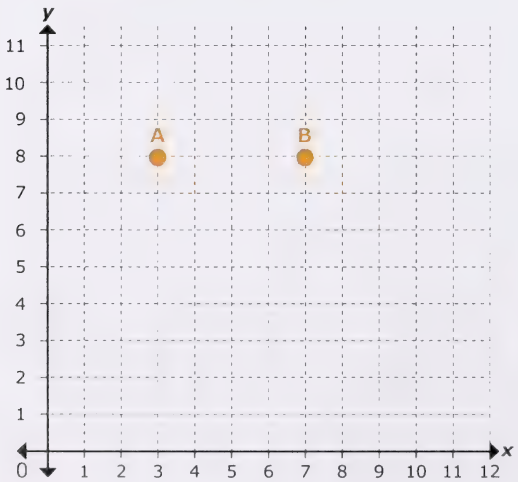
Label the points C and D. Connect the points to form a square.



The points needed to complete the square are: **(6, 1)** and **(6, 5)**

Example 6

Zach is using a coordinate plane to design a garden. His garden will be a rectangle with a perimeter of 20 metres. He has graphed the first two points of the rectangle. Complete the rectangle and name the vertices of the rectangle.



Each unit on the plane represents 1 metre. Note: Do not extend the given coordinate plane to make the rectangle.

Find the distance from A to B:
4 units

Reasoning: A rectangle has opposite sides that are equal in length and parallel.

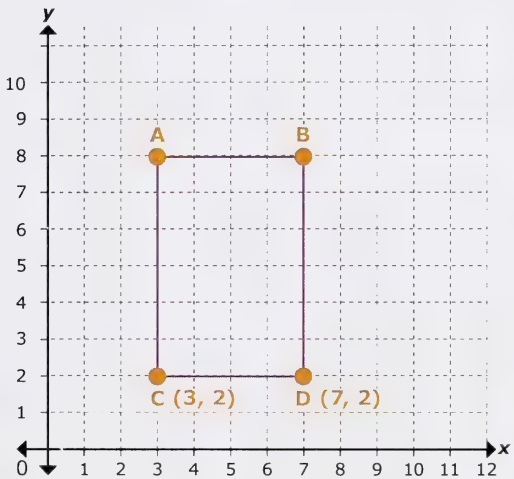
Two sides will have a length of 4. That is a total of 8 units.

The total of the other two sides plus the 8 units needs to be 20.

$$n + 8 = 20$$
$$12 + 8 = 20$$

The other two sides must have a combined length of 12 units.

If each is the same length then the length of each side is 6 units.

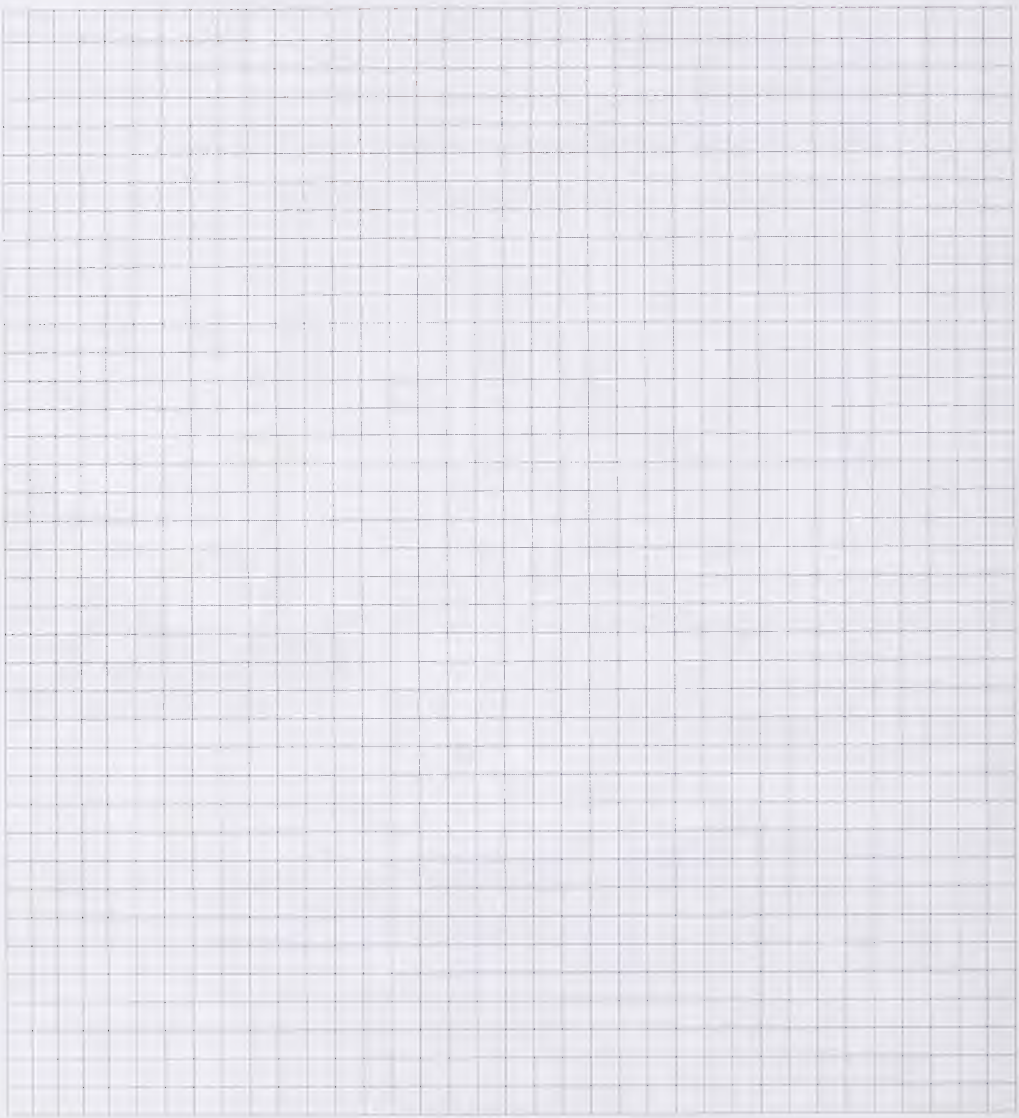


Use this length to draw the figure:

The other two vertices are **(3, 2)** and **(7, 2)**.

Let's Practice

- Go online to watch the Notepad Tutor Lesson: Distances Between Points in First Quadrant of a Cartesian Plane.
- Turn in your Workbook to Unit 2, Lesson 12 and complete 1 to 18.



Lesson 13

Collecting Data

Opinion Surveys

There are many questions that can be answered using surveys. The student government of a school may want to know how the students feel about the variety of food offerings at lunch. They can conduct a survey to analyze the perceptions of the student body.

What do you think of the variety of food offered at your school?

Reflection

What are some surveys you have participated in? What could the information gathered by the survey be used to analyze?

Objectives for this Lesson

In this lesson you will explore the following concepts:

- Select a method for collecting data to answer a given question
- Design and administer a survey for collecting data
- Answer a given question by performing an experiment
- Record the results of a given survey
- Gather data for a given question by using electronic media
- Gather data from databases

- Go online to watch the Notepad Tutor Lesson: First-Hand vs. Second-Hand Data.

Data Sources

Data is used to describe many issues such as social or physical situations around us. You must be able to evaluate the statistical information that you will encounter during your life. To understand data you must first learn to collect the data.

There are many ways to collect data. You must begin by analyzing the question that needs to be answered.

Perform an experiment:

Sample Question: What is your resting heart rate?

To gather data for this question you could rest for a time and take your heart rate.

Conduct a survey:

Sample Question: What is the favourite video game of the sixth grade students?

To answer this question you could create a survey and have some students in the sixth grade respond.

Use a database to research trends:

Sample Question: How would you describe the weather in Victoria, British Columbia for the month of February?

To answer this question you could research the trends in the weather for February in Victoria for many different years. This information can be found in a database or an almanac.

Surveys

You can use a survey to collect information from a group of people called a **population**.

Each election year you will hear or read that a candidate is leading the race. The data that is presented comes from a survey. They do not ask every person who can vote who they will vote for on election day. They question a smaller group of the population called a **sample** and use their results to give a prediction.

How many people should you survey?

If you are asking a question that applies to a large population, then you can select a sample. A good sample must be:

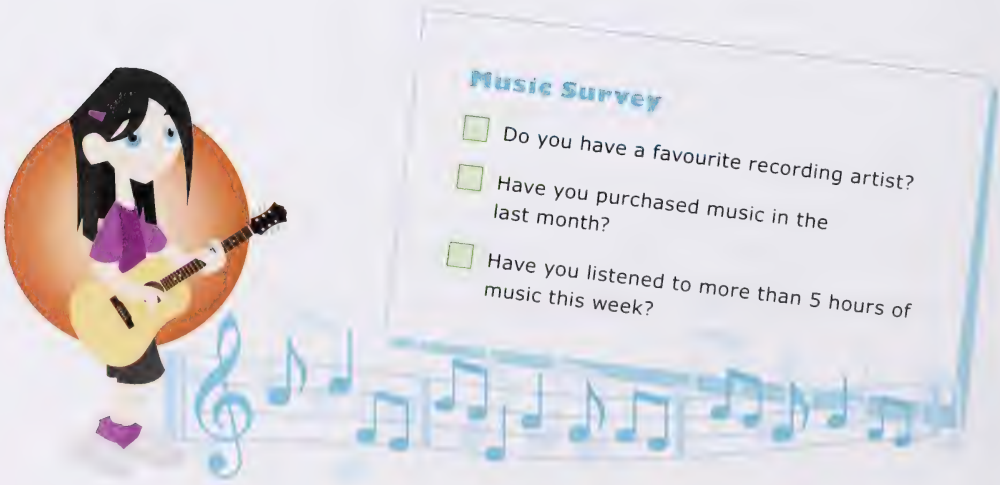
- representative of the population
- selected at random
- large enough to give a good representation of the group

Let's Explore

Exploration 1: Researching Surveys

Materials: Unit 2, Lesson 13, Exploration 1 page in your Workbook, Internet or Magazines or Newspapers, Pencil

1. Use the Internet, Magazines, or Newspapers to search for popular surveys.
2. Print or cut out one survey and paste it on the Exploration page in your Workbook.
3. What question does the information in the survey answer?
4. Describe the population that the survey represents.
5. How many people were surveyed?
6. Repeat for three more surveys.
7. Reflect: Are the surveys you found representative of the populations they address?
8. Reflect: Were the surveys given to a good sample? Why or why not?


Music Survey
Do you have a favourite recording artist?
Have you purchased music in the last month?
Have you listened to more than 5 hours of music this week?

Example 1

Alyssa wants to know how fast the motorists drive when going by the school each morning. How could she answer her question?

A. Survey B. Perform an Experiment C. Research a Trend

Since Alyssa is asking a question about the driving speed of motorists in a specific school area, she will probably not be able to find the data in a database. That means she will not "Research a Trend."

Alyssa could give a survey. The survey would need to be conducted by selecting random motorists that drive by the school in the mornings.

Alyssa could also perform an experiment. She could have a police officer with radar help her to record the driving speed of motorists.

As you can see, when it comes to data, there are many ways to gather and collect data. Once you have the data, how do you organize the data?

Organizing Data

When you are gathering data you can use a number of methods. One method is to create a frequency chart. You can tally the number of times something occurs in a frequency chart and then record the total at the end of the survey or experiment.

Example 2

Alyssa recorded the following speeds in the school zone in front of her school one morning. Organize the data in a frequency chart.

Speed in km/hr:

28 30 29 28 30 32 36 25 24 35 28 26 25 34 30

28 24 38 40 31 29 29 28 32 29 27 27 25 35 36

34 38 24 28 29 32 26 37 28 27 25 24 32 34 32

Create a table with the following headings:

Speed	Tally	Frequency

Mark off each speed from the list as you record a tally mark in the tally column.

One tally: |

Five tallies: 𝍸

Write each speed, starting with the smallest, in the first column. After you have made a tally mark for each number, total the tallies in the frequency column:

How fast do motorists drive by the school?					
Speed	Tally	Frequency	Speed	Tally	Frequency
24	𝍸	4	33		
25	𝍸	4	34	𝍸	3
26	𝍸	2	35	𝍸	2
27	𝍸	3	36	𝍸	2
28	𝍸 𝍸	7	37	𝍸	1
29	𝍸	5	38	𝍸	2
30	𝍸	3	39		
31	𝍸	1	40	𝍸	1
32	𝍸	5			

Now you have organized the data. The data helps Alyssa to answer her question: How fast do motorists drive by the school?

Motorists passing the school drove at speeds ranging from 24 to 40 km per hour. The most common or frequently recorded speed was 28 km per hour.

Reflection

What else should Alyssa consider when answering her question? Is there other data that she needs to support her answer?

Let's Practice

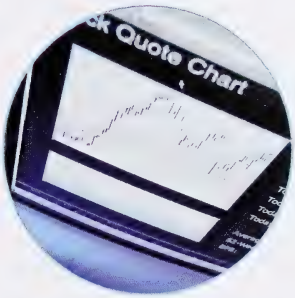
- Turn in your Workbook to Unit 2, Lesson 13 and complete 1 to 15.

Lesson 14

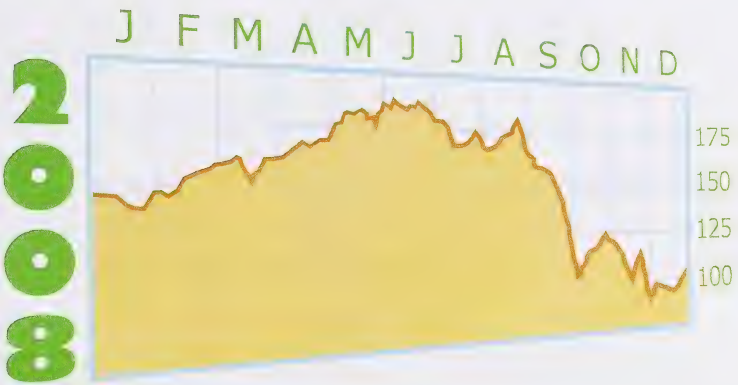
Creating a Line Graph

Market Indices

The Canadian Stock Market tracks the growth of indices for a given day, week, month or year. The line graphs they use help the investors of these markets to see the trends in the stocks over a given amount of time. Traders use the trends to determine the best time to buy or sell stocks. Investors use the trends to see how stable the investment is for the given amount of time.



Sample Index Graph



In this lesson you will learn how to make line graphs from given data and when the use of a line graph is appropriate.

Reflection

Do you remember the parts of a line graph?

Objectives for this Lesson

In this lesson you will explore the following concepts:

- Determine the common attributes of line graphs
- Determine whether a given set of data is continuous or discrete
- Create a line graph from a given table of values or set of data

- Go online to complete the Concept Capsule: Creating Double Bar Graphs.

Attributes of Line Graphs

There are certain parts of a line graph that must be present in order to analyze the data. Use the following exploration to list and define these attributes.

Let's Explore

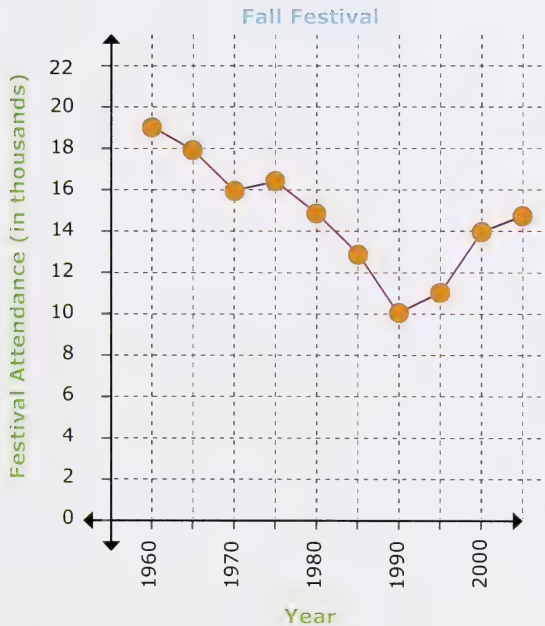
Exploration 1: Line Graphs

Materials: Unit 2, Lesson 14, Exploration 1 page in your Workbook, Pencil

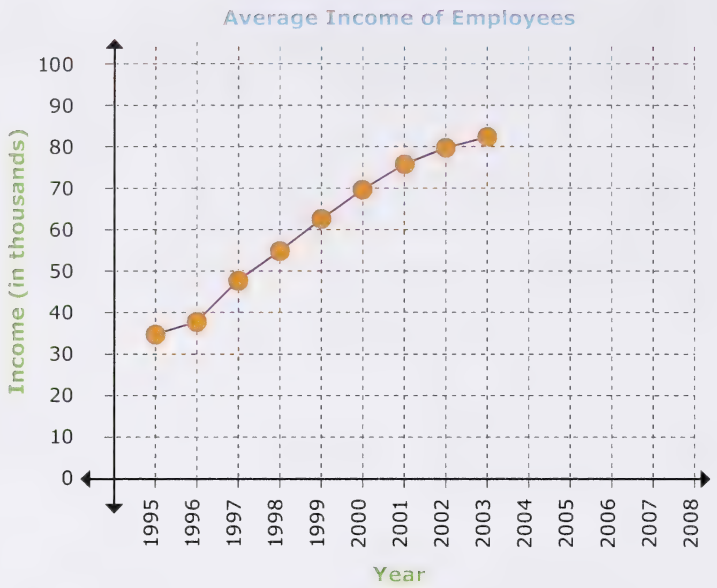
Observe these line graphs. Identify the following parts for each graph:

a. Title b. x-axis c. y-axis d. Intervals

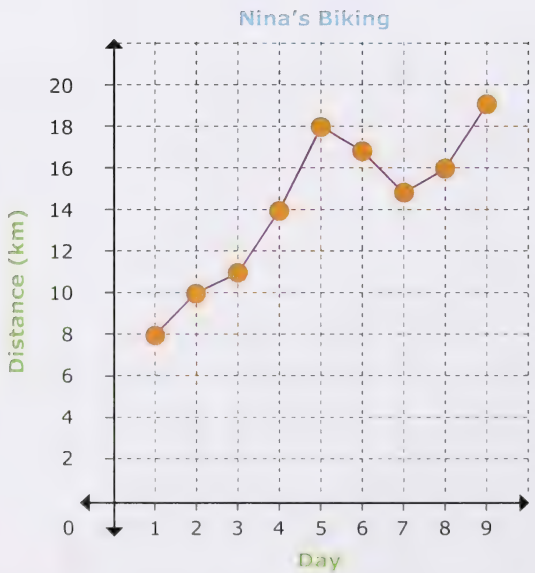
1.



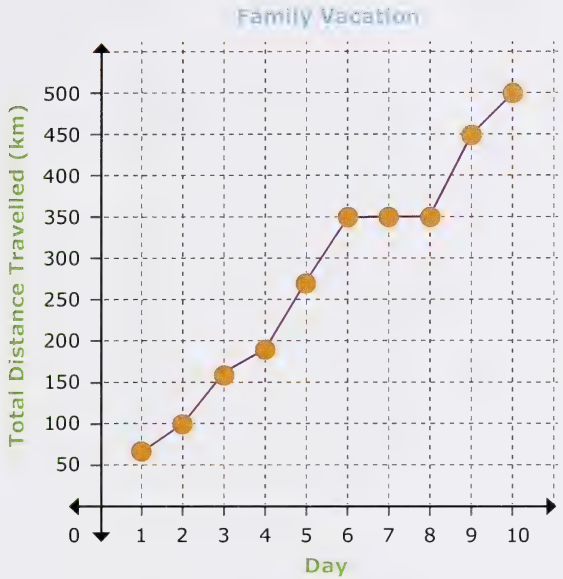
2.


Average Income of Employees
Income (in thousands)
100
90
80
70
60
50
40
30
20
10
0
1995
1996
1997
1998
1999
2000
2001
2002
2003
2004
2005
2006
2007
2008
Year

3.


Nina's Biking
Distance (km)
20
18
16
14
12
10
8
6
4
2
0
1
2
3
4
5
6
7
8
9
Day

4.

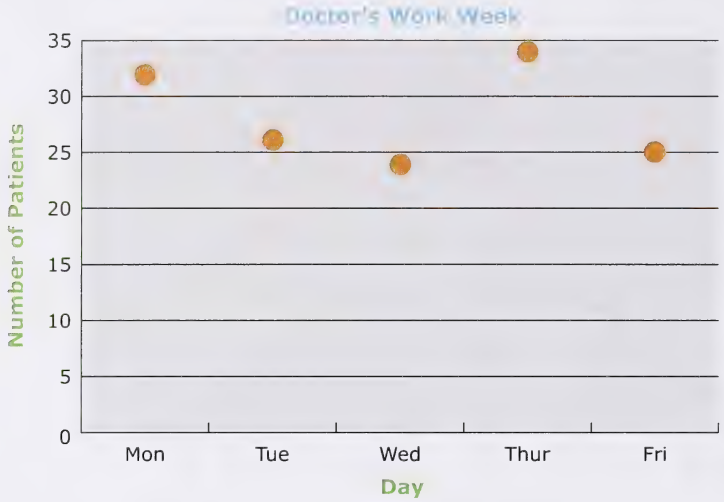


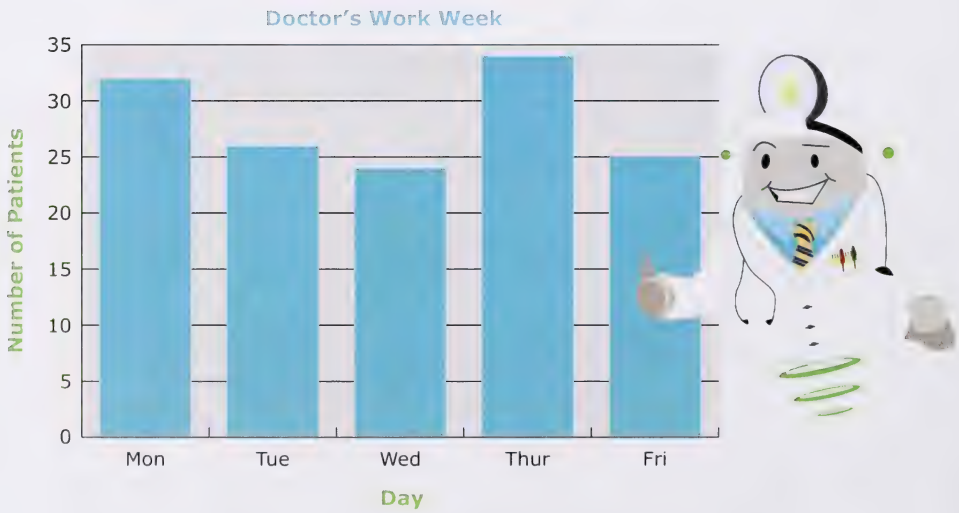
Discrete and Continuous Data

There are two major types of data. **Discrete data** and **continuous data** are used to analyze patterns in situations that occur in the real world. You can tell the difference using the following attributes:

Discrete	Continuous
You can only answer the question using whole numbers and you can count the responses.	There are an unlimited number of responses possible and they can be fractions or decimals.
Examples: • Age in years • Number of people in one household • Blood types	Examples: • Time to travel a certain distance • Height in cm of a growing child • Temperature throughout a day

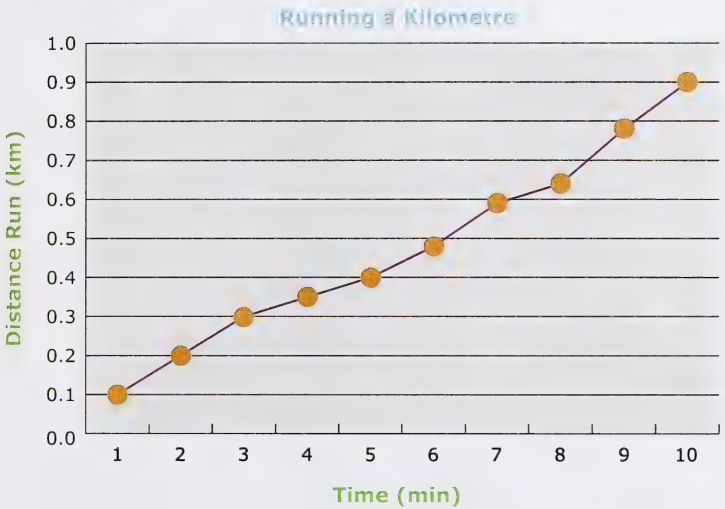
Discrete data is usually displayed using a series of points or a bar graph:





There are a limited number of days in the week and the doctor can only see a countable number of patients in one day. This data is discrete so the graph on the previous page does not have connected dots.

Continuous data is often displayed using a line graph:



This is an example of continuous data. The runner never stops running. The time does not stop throughout the run and can be measured in seconds as well as the minutes shown on the graph. The distance can be measured in decimals or part of a kilometre.

Example 1

Use the given data to answer the following questions.

Daksha and Alyssa are running the track at school.

a. Is the data continuous or discrete?

b. What is a good title for the graph?

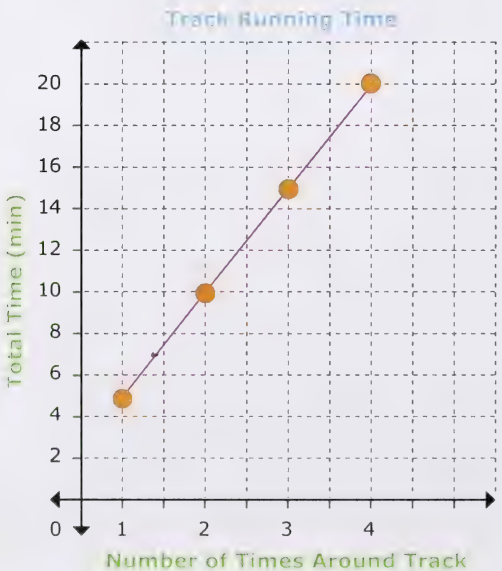
c. Create a graph of the data.

Number of Times Around Track	Total Time (min)
1	5
2	10
3	15
4	20

a. The data is continuous. The time does not end. You could describe a half of a lap or any part of a lap and find the time it took them to travel that distance.

b. A good title describes the situation: Track Running Time

c.



Example 2

Use the given data and answer the following questions.

Alyssa and Cameron are making friendship bracelets to raise money for charity. The table shows the number of beads needed to create bracelets of different lengths.

Bracelet length (cm)	16	18	20	22
Number of beads	24	28	32	36

a. Is the data continuous or discrete?

b. What is a good title for the graph?

c. What interval would you use for the scale?

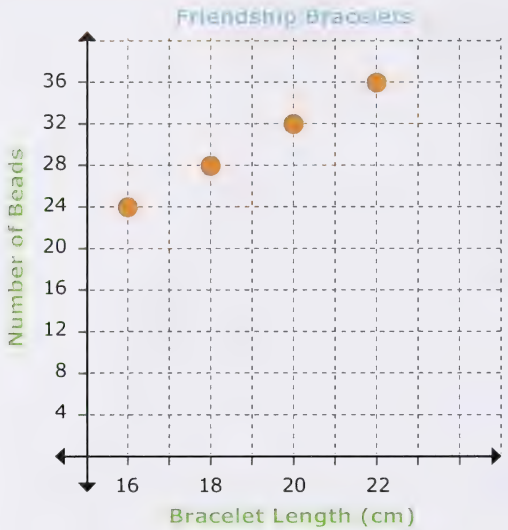
d. Create a graph of the data.

a. The data is discrete. There are a limited number of bracelet lengths that they will create. The number of beads is determined by these lengths and is in a small range of values.

b. The data describes the bracelets: Friendship Bracelets

c. The x-axis will have the bracelet lengths displayed. The y-axis could have an interval of 4 since all values are multiples of 4.

d.



Let's Practice

- Turn in your Workbook to Unit 2, Lesson 14 and complete 1 to 15.

Lesson 15

Analyzing Data

Predicting Stock Values

Large companies are owned by many people. The people buy shares of stocks from the company. The value of stocks can vary greatly from hour to hour. Stock brokers buy or sell the stocks for people. They can look at trends in the stock values to advise their clients when to buy or sell.

The price of Nintendo stock is recorded in this line graph for the year 2008.

Nintendo Stock for 2008

Reflection

What was the highest value of the stock in 2008? Does it look likely that the stock will increase in 2009?

Objectives for this Lesson

In this lesson you will explore the following concepts:

- Answer a given question by performing an experiment
- Interpret a given line graph to draw conclusions
- Solve a given problem by graphing data and interpreting the resulting graph

Graphing Trends

You can use line graphs to analyze data over time. This is called identifying a trend in the data. You can find data in many places. Use the Internet or an almanac to complete the following exploration.

Let's Explore

Exploration 1: Researching the Environment

Materials: Unit 2, Lesson 15, Exploration 1 page in your Workbook, Internet or an Almanac or Newspapers, Pencil

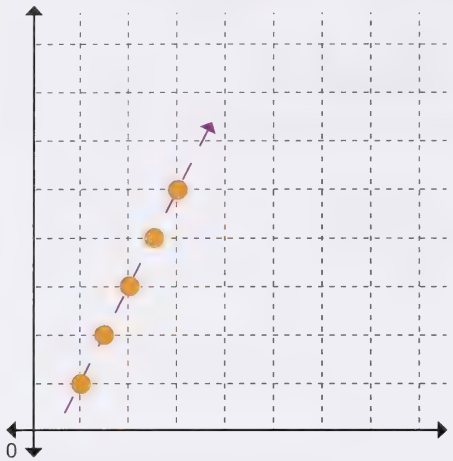
1. Use the Internet, an almanac or newspapers to find data about the natural environment in your city or region. You can find data for the last several months, years, or decades. For example: water conservation, soil conservation, recycling efforts...
2. Organize data that you have found into a table.
3. Create a line graph of your data over time.

For 4: Either record oral observations or write them in your Workbook. If recording, follow the recording instructions in your Workbook.

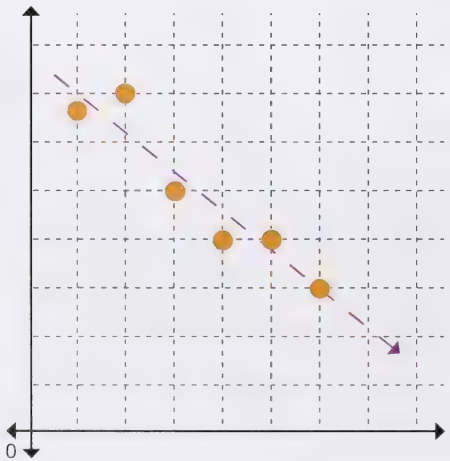
4. Write three observations you can make by looking at your line graph.

Relationships in Graphs

Some graphs have data that forms a straight line:



Some graphs do not have data that lines up so nicely:



You can use either of these types of data to make predictions.

The first graph has values that are increasing. The second graph has values that are decreasing.

Example 1

The average income for employees of a company is shown in the graph.

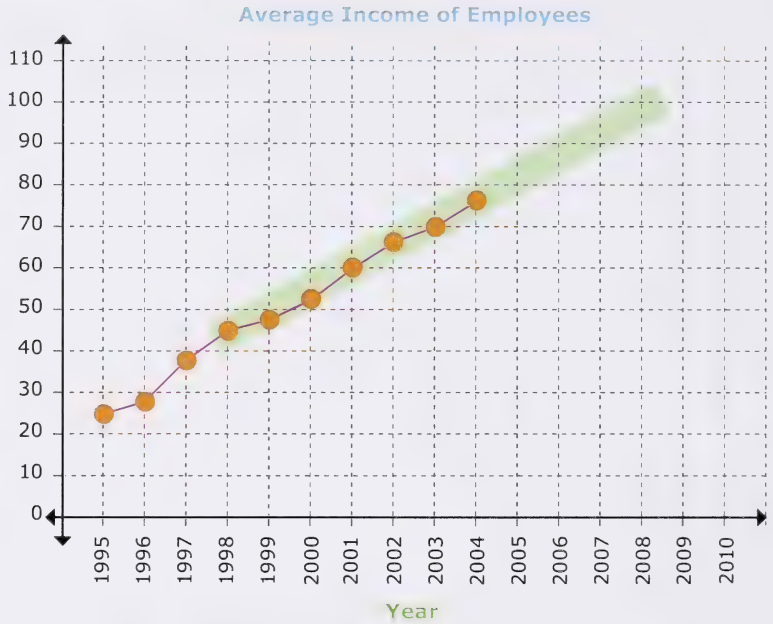
a. Describe the change in average salary over time.

b. Predict the income in 2010.

c. In what year did the employees have the greatest gain in average income?

a. The average salary is increasing over time. The change is not constant from one year to the next.

b. The income in 2010 can be predicted by estimating where the line would be in 2010. A good estimate is between $80 000 to $110 000. You can tell by extending the line:



You can extend the line in many ways. Here the highlighted area shows where the line may fall if it is extended. You can do this with a straight edge. Line it up with the first and last points of the line. Where does the extension take the line?

c. The greatest gain in average income occurred in 1997. You should not subtract each pair of values to find this information. You can tell because the line between 1996 and 1997 is the steepest on the graph.

Let's Explore

Exploration 2: Researching Population Trends

Materials: Unit 2 Lesson 15, Exploration 2 page in your Workbook, Internet or Newspapers, Pencil

Find a resource that reports the population of your city or town for the past ten to twenty years. Create a line graph of the population. Answer the following questions:

1. Is the population in your area increasing or decreasing?
2. How can you tell?
3. Find the difference in the population between the last two years or increments.
4. If this difference occurs for the next year or increment, what will be the population of your area?

Example 2

Daksha and Lian are researching the air quality in Edmonton. Here is a chart of the data they found about the carbon monoxide concentration in Edmonton.

Annual Average Carbon Monoxide Concentration in Edmonton

Year	1999	2000	2001	2002	2003	2004	2005
Concentration (ppm)	0.71	0.65	0.72	0.61	0.57	0.48	0.42

a. Is the data continuous or discrete?

b. What is a good title for the graph?

c. What increment will you use on the y-axis?

d. Create a line graph for the data.

e. What is the difference in the concentration of carbon monoxide from 2004 to 2005?

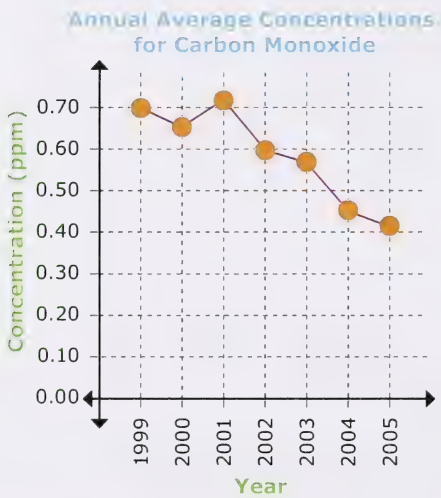
f. Between what two years did the carbon monoxide concentration decrease the most?

a. The data is continuous. The time does not stop and start and the concentration of carbon monoxide can change from day to day.

b. One possible title is: Annual Average Concentrations for Carbon Monoxide

c. You could use 0.1 as an increment on the y-axis.

d.



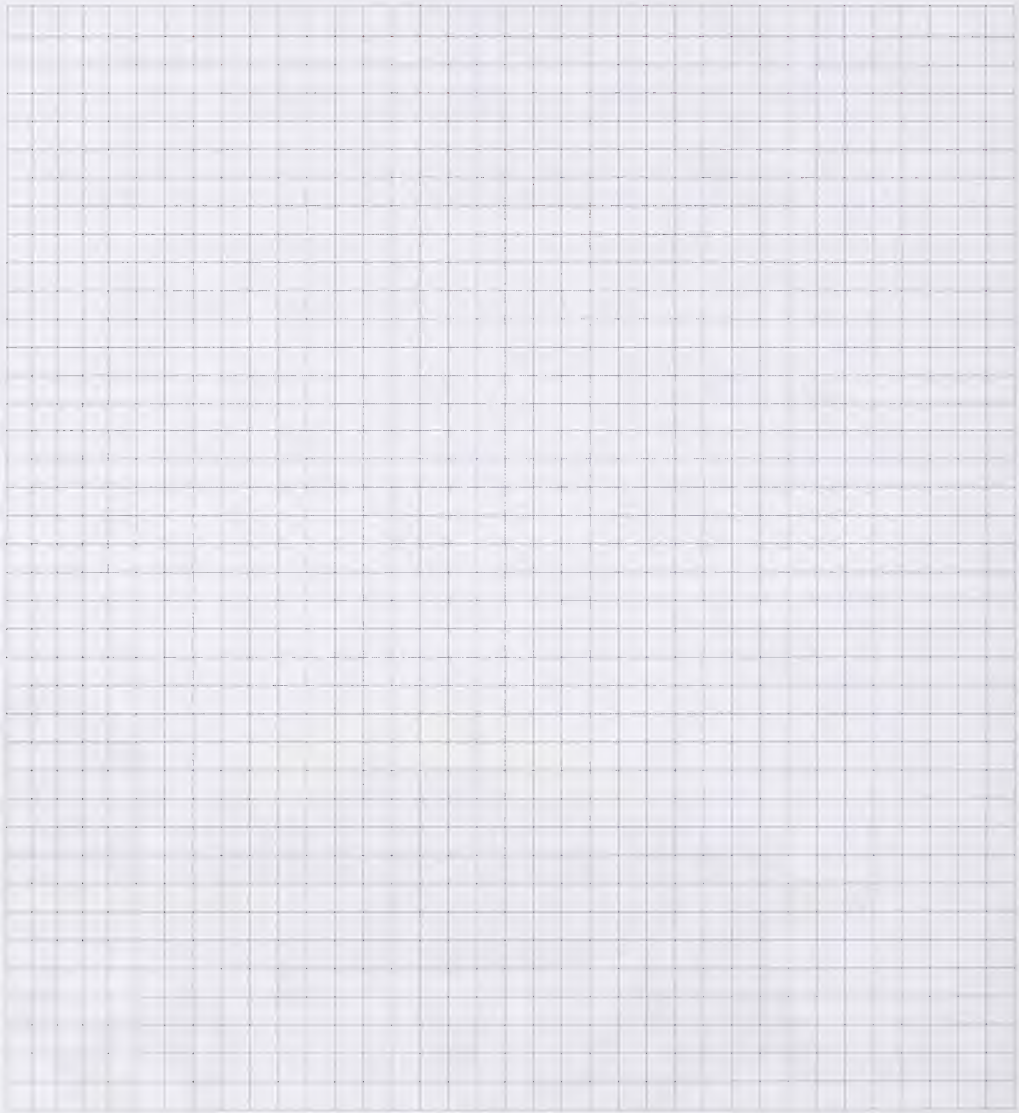
e. The difference in carbon monoxide concentration from 2004 to 2005 can be found by subtracting: 0.48 – 0.42 = 0.06 ppm

The difference is: 0.06 ppm

f. The carbon monoxide concentration decreases the most between 2001 and 2002. You can tell because the line is the steepest between these two points.

Let's Practice

- Go online to watch the Notepad Tutor Lesson: Interpreting Line Graphs.
- Turn in your Workbook to Unit 2, Lesson 15 and complete 1 to 11.
- Go online to watch the Notepad Tutor Lesson: Using or Not Using Outliers.
- Go online to SuccessChecker and complete the Unit test to check your understanding.
- Go online to play games that will help you review your glossary terms.



Sources - Student Learning Guide

Lesson 1
Page 2-4: Example 1, http://www.thecanadianencyclopedia.com/index.cfm?PgNm=TCE&Params=a1ARTA0010200

Lesson 2
Page 2-9: Comparing Temperatures, http://www.ncdc.noaa.gov/oa/climate/globalextremes.html

Lesson 3
Page 2-15: Ice Hockey, http://www.britannica.com/EBchecked/topic/281126/ice-hockey

Lesson 5
Page 2-35: Baseball Stadiums, http://www.rio.gouv.qc.ca/servlet/file?id=41, http://www.rogerscentre.com/about/facts.jsp

Lesson 6
Page 2-45: Whales, http://animals.nationalgeographic.com/animals/mammals.html

Lesson 7
Page 2-57: Tiger Salamander, http://amphibiaweb.org/cgi-bin/amphib_query?query_src=aw_maps_geo-noam&rel-isocc=like&orderbyaw=Order&where-isocc=Canada

Lesson 9
Page 2-73: Travelling by Train, http://www.canadayourway.com/Canada-Vacation-Packages/Rail/Canadian-Express-Toronto-to-Vancouver#tabs

Lesson 10
Page 2-85: Reading Maps, http://geography.about.com/cs/latitudelongitude/a/latlong.htm

Lesson 11
Page 2-93: Weekly Earnings, www.statcan.gc.ca, http://www40.statcan.gc.ca/l01/cst01/labr79-eng.htm

Lesson 12
Page 2-103: Embroidery in Cultures around the World, http://www.wumag.kiev.ua/wumag_old/archiv/1_97/dress.htm, http://www.bayeuxtapestry.org.uk/

Lesson 15
Page 2-133: Predicting Stock Values, http://moneycentral.msn.com/investor/charts/chartdl.aspx?PT=7&compsyms=&D4=1&DD=1&D5=0&DCS=2&MA0=0&MA1=0&CP=1&C5=1&C5D=1&C6=2008&C7=12&C7D=31&C8=2008&C9=-1&CF=0&D7=&D6=&showchartbt=Redraw+chart&symbol=NTDOY&nocookie=1&SZ=0, *Page 2-139:* Example 2, http://www.casadata.org/Reports/CasaC1.asp?PGID=&Parameter=42101&StationID=01004&ColTypes=1&RType=C1&SourceID=-1&ParameterList=42101&StationList=01004&ToYear=2008

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